Operator's Manual

Life Scope TR

Bedside Monitor

BSM-6301/BSM-6501/BSM-6701

BSM-6000 series
BSM-6301A
BSM-6301K
BSM-6501A
BSM-6501K
BSM-6701A
BSM-6701K

0614-900685H

NIHON KOHDEN

If you have any comments or suggestions on this manual, please contact us at: www.nihonkohden.com

Copyright Notice

The entire contents of this manual are copyrighted by Nihon Kohden. All rights are reserved. No part of this document may be reproduced, stored, or transmitted in any form or by any means (electronic, mechanical, photocopied, recorded, or otherwise) without the prior written permission of Nihon Kohden.

Trademark

The mark printed on the SD card that is used in this instrument is a trademark. The company name and model name are trademarks and registered trademarks of each company.

Contents

About this Manual 1
Related Documentation 1
Intended Purpose 2
Precautions 4
  General Handling Precautions 4
  EMC Related Caution 4
  Other Caution 6
Responsibility of the Manufacturer 6
Conventions Used in this Manual and Instrument 7
  Warnings, Cautions and Notes 7
  Text Conventions in this Manual 7
  Explanations of the Symbols in this Manual and Instrument 8
General Safety Information 11
Panel Description 13
  MU-631R Main Unit 13
  MU-651R/MU-671R Main Unit 15
  AY-631P/AY-633P/AY-651P/AY-653P/AY-660P/AY-661P/AY-663P/AY-671P/AY-673P Input Unit 17
  AA-672P/AA-674P Smart Expansion Unit 19
Installation 21
  General 21
    Grounding the Monitor 22
    Environment for External Instruments 22
    Warnings and Cautions for Connecting the Monitor to a Network 23
  Inserting and Removing the Battery Packs 24
    Inserting the Battery Pack 24
    Removing the Battery Pack 25
  Inserting and Removing the Input Unit 26
    Inserting the Input Unit 26
    Removing the Input Unit 26
  Loading Recording Paper 27
Turning the Monitor On or Off 28
  Turning the Monitor On 28
    Check Before Turning On the Power 28
    Check After Turning On the Power and During Monitoring 29
    Power and Battery Status Indications 30
    Battery Pack Handling and Operation 31
    Charging the Battery Pack 33
  Monitor Status on Power Interruption 34
  Turning the Monitor Off 34
    Check After or Before Turning the Power Off 34
Basic Operation 35
  Using the Hard Keys on the Bedside Monitor and Touch Screen 35
  Using the Remote Control 35
  Using the Mouse 35
Home Screen Description 36
  Settings for the Home Screen 37
  Trendgraph on the Home Screen (Current Trendgraph) 38
    OCRG 38
  Freezing Waveforms 38
  Using Sleep Mode 38
MENU Window Description 39
Changing Settings 40
  Administrator Settings 40
  Changing Parameter Settings and Other Settings 40
    Changing Settings 40
    Changing Settings on the VOLUME Window 41
Admitting a Patient/Discharging a Patient (Deleting Data) 42
  Admitting a Patient 43
  Discharging a Patient (Deleting Data) 44
Transport 45
    Warnings and Cautions for Transport 45
Alarms 47
  Alarm Types and Levels 47
  Alarm Control Marks 48
  Flow of Alarm Function 49
  Silencing/Suspending Alarms 50
    Silencing Alarms 50
    Suspending Alarms 50
  Canceling Technical Alarms 53
  Alarm Sound Volume 53
  Alarm Recording 53
  Alarm Setting 53
    Changing Vital Sign Upper/Lower Alarm Limits 55
    Changing the Arrhythmia Alarm Settings 57
  Interbed Alarm 58
Review Windows 59
  General 59
    Event Bar 60
  TREND Window 61
    GRAPH 1, GRAPH 2, GRAPH 3 Page 61
    TABLE 1, TABLE 2, TABLE 3 Page 62
    NIBP TREND Page 63

    - HEMO Page 64
    - Registering the Acquired Data to the Hemodynamics Table Window 64
    - LUNG TREND Page 65
  - RECALL Window 66
    - ARRHYTH HISTORY Page 66
  - ALARM HISTORY Window 67
    - ALARM HISTORY Page 67
  - FULL DISC Window 68
    - FULL DISC Page 68
  - ST Window 70
    - ST INTERVAL Page 70
  - OCRG Window 71
- 12 LEAD/12 LEAD ANALYSIS Windows 72
  - General 72
    - Performing 12 Lead ECG Interpretation 72
  - 12 LEAD Window 74
    - Viewing the 12 Lead Analysis Result 74
- DRUG/LUNG FUNCTION Windows 76
  - DRUG Window 76
  - LUNG FUNCTION Window 78
- Recording 80
  - Recording Modes 80
    - When More than One Recording Modes is Triggered 80
  - Changing Recording Settings 80
    - Selecting Recording Waveforms 81
    - Changing Recording Speed 81
    - Selecting Recording Interval for Periodic Recording 81
    - Turning Alarm Recording On or Off 81
- INTERBED Window 82
  - Registering/Removing Interbed Beds 82
  - Displaying the Interbed Bed Data 83
  - Interbed Alarm 84
    - Settings Related to Interbed Alarm 84
- Monitoring Parameters 85
  - ECG 85
    - Preparation 85
    - Monitoring Arrhythmia 88
    - Changing ECG Settings 90
  - Respiration 97
    - Preparation 97
    - Changing Respiration Settings 98
  - CO$_2$ 100
    - Preparation 101
    - Changing CO$_2$ Settings 104
    - Inspection of Measuring Accuracy 106
  - SpO$_2$ with Nihon Kohden Probes (AY-660P/AY-661P/AY-663P/AY-671P/AY-673P) 107
    - Silencing SpO$_2$ Alarm 108
    - Preparation 108
    - Changing SpO$_2$ Settings 110
  - SpO$_2$ with Nellcor Probes (AY-651P/AY-653P) 114
    - Silencing SpO$_2$ Alarm 115
    - Preparation 115
    - Changing SpO$_2$ Settings 117
  - SpO$_2$ with Masimo Probes (AY-631P/AY-633P) 120
    - Silencing SpO$_2$ Alarm 121
    - Preparation 121
    - Changing SpO$_2$ Settings 124
  - NIBP 128
    - Preparation 128
    - Changing NIBP Settings 130
    - Starting and Stopping NIBP Measurement 132
  - IBP 136
    - Preparation 136
    - Connecting Cables to the Unit 136
    - Assembling the Transducer 137
    - Adjusting Zero Balance 138
    - The CHECK ZERO Page 139
    - Changing IBP Settings 139
  - Temperature 144
    - Preparation 144
    - Using the Insulation Pad 145
    - Changing Temperature Settings 145
  - BIS 147
    - Preparation 147
    - Changing the BIS Settings 150
  - Cardiac Output 153
    - Preparation 153
    - Measuring the Pulmonary Capillary Wedge Pressure 154
    - Measuring Cardiac Output 155
    - Deleting the Data from the CO Table 158
    - Adding the Acquired Data to the HEMO Page of the TREND Window 159
  - GAS 160
    - Preparation 160
    - Changing Gas Settings 160
    - Inspection of Measuring Accuracy 164
  - O$_2$ 165
    - Preparation 165
    - Changing O$_2$ Settings 166
  - Other Parameters 167
- Screen Messages 169
- Troubleshooting 185
  - Monitoring 185

  - Network 185
  - Transport 186
  - Remote Control 187
  - Recording 187
  - Printing 187
  - ECG 188
  - Respiration 189
    - Impedance Method 189
    - Thermistor Method 189
  - CO$_2$ 190
    - Mainstream Method 190
    - Sidestream Method 190
    - When Using Microcap® Monitor 191
  - SpO$_2$ 191
    - When Using Nellcor/Masimo Pulse Oximeter 192
  - NIBP 192
  - IBP 193
  - Temperature 193
  - BIS 193
    - When Using BIS Processor/BISx 193
    - When Using BIS Monitor 193
  - Cardiac Output 194
  - GAS 194
    - When Using AG-920R Multigas Unit 194
    - When Using GF-110PA Multigas Unit or GF-120PA Multigas/Flow Unit 195
    - When Using GF-210R Multigas Unit or GF-220R Multigas/Flow Unit 196
    - When Using Dräger Medical Primus/Fabius® Anesthesia Workstation 197
  - O$_2$ 197
  - Ventilation 197
  - TOF 198
  - CCO 198
    - When Using Vigilance Monitor 198
    - When Using PiCCO Monitor 198
  - CCO/S$\bar{v}$O$_2$ 199
  - FLOW/Paw 199
    - When Using GF-110PA Multigas/Flow Unit 199
    - When Using GF-220R Multigas/Flow Unit 199
  - EEG 200
  - tcPO$_2$/tcPCO$_2$ 201
  - Transmitter 201
  - 12 Lead ECG 201
- Maintenance 202
  - MU-631R, MU-651R and MU-671R Main Unit 202
    - Cleaning and Disinfecting the Main Unit 202
    - Cleaning the Touch Screen 203
    - Disposing of the Main Unit 204
  - WS-671P Recorder Module 204
    - Cleaning the Thermal Head 204
    - Cleaning the Sensors 204
    - Disposing of the Recorder Module 204
  - AY Series Input Unit and AA-672P/AA-674P Smart Expansion Unit 205
    - Cleaning and Disinfecting the Units 205
    - Disposing of the Units 205
  - SB-671P Battery Pack 205
    - Battery Lifetime 205
    - Replacing the Batteries 205
    - Disposing of Batteries 205
  - RY-910P Remote Controller 205
    - Cleaning and Disinfecting the Remote Controller 205
    - Disposing of the Remote Controller 205
    - Replacing the Batteries 205
    - Disposing of Batteries 205
  - QF series Interface and IF series Communication Cable 205
    - Cleaning and Disinfecting the Interface and Communication Cable 205
    - Disposing of the Interface and Communication Cable 205
  - Leads, Cables and Cords 206
    - Cleaning the Leads, Cables and Cords 206
    - Disinfecting the Leads, Cables and Cords 206
    - Disposing of Leads, Cables and Cords 206
  - Electrodes, Probes, Cuffs, Thermistors, Transducers, Catheters and Other Consumables 206
  - Yearly Inspection 206
  - Safety Information for Maintenance on Optional Units 207
    - AG-920R, GF-110PA or GF-210R Multigas Unit and GF-120PA or GF-220R Multigas/Flow Unit 207
    - AG-400R CO$_2$ Unit 207
    - AE-918P Neuro Unit 208
- Specifications 209
    - Measuring Parameters 209
    - Influence on Measuring Accuracy by Electrosurgery/Defibrillation/Electrostatic Discharge 209
    - Display 209
    - Alarm 210
    - Alarm Delay Time 211
    - ECG 211

    - Respiration (Transthoracic impedance pneumography) 214
    - SpO_2 214
    - Non Invasive Blood Pressure, NIBP 217
    - Multi Socket 218
    - Invasive Blood Pressure, IBP 218
    - Temperature 219
    - Carbon Dioxide, CO_2 (Mainstream method) 219
    - Inspired Oxygen Fractional Concentration, O_2 220
    - Cardiac Output, CO 220
    - Respiration (Thermistor method) 221
    - Bispectral Index, BIS 221
    - ECG/BP Output 221
    - RGB Socket (when QI-631P or QI-671P is connected) 222
    - RS-232C Socket (when QI-631P or QI-671P is connected) 222
    - Alarm Socket (when QI-632P or QI-671P is connected) 222
    - When WS-671P Recorder Module is Connected 222
    - When ZS-900P Transmitter is Connected 223
    - Gas 223
    - Carbon Dioxide, CO_2 (Sidestream method) 226
    - FLOW/Paw 226
    - EEG 227
    - Battery (SB-671P Battery Pack) 228
    - Power Requirement 228
    - Clock Accuracy 228
    - Environment 228
    - Mechanical Strength 229
    - Electromagnetic Compatibility 229
    - Safety Standard 229
    - Dimensions and Weight (approximate) 230
    - Electromagnetic Emissions 231
    - Electromagnetic Immunity 232
    - Recommended Separation Distances between Portable and Mobile RF Communications Equipment 234
    - System Composition for EMC Test 235
- Factory Default Settings 236
  - Event Bar 236
  - TREND Window 237
  - RECALL Window 240
  - FULL DISC Window 240
  - ST Window 240
  - OCRG Window 241
  - ADMIT Window 241
  - ALARM LIMITS Window 242
    - Vital Signs Alarms 242
    - Arrhythmia Alarms 245
  - DATE Window 245
  - VOLUME Window 246
  - DISPLAY Window 246
  - RECORD Window 246
  - ECG Window 247
  - RESP/CO_2 Window 248
  - SpO_2 Window 248
  - NIBP Window 249
  - PRESS Window 250
  - TEMP Window 251
  - BIS Window 251
  - CO Window 251
  - GAS Window 252
  - O_2 Window 252
  - VENT Window 252
  - CCO Window 253
  - FLOW/Paw Window 253
  - EEG Window 254
  - 12 LEAD ANALYSIS Window 255
  - DRUG Window 255
  - LUNG FUNCTION Window 257
  - INTERBED Window 257
- Standard Accessories 258
  - MU-631RA/MU-651RA/MU-671RA Main Unit 258
  - MU-631RK/MU-651RK/MU-671RK Main Unit 258
- Options/Consumables 259
  - Accessory Set 259
  - MU-631RA/MU-651RA/MU-671RA Main Unit 260
  - MU-631RK/MU-651RK/MU-671RK Main Unit 260
  - WS-671P Recorder Module 261
  - Units and Modules 261
  - Network 261
  - Interfaces for Connecting External Instruments 262
  - Cart and Attaching Parts 263
  - For ECG and Respiration (Impedance Method) Monitoring 263
  - For Respiration Monitoring (Thermistor Method) 264
  - For CO_2 Monitoring (Mainstream Method) 264
  - For SpO_2 Monitoring 265
  - For NIBP Monitoring 266
  - For IBP Monitoring 267
  - For Temperature Monitoring 268
  - For BIS Monitoring (Using the BIS Processor/BISx) 268

For CO Monitoring 268
For O_2 Monitoring 269
For CO_2 Sidestream Monitoring......................... 269
For BIS Monitoring (Using the BIS Monitor) 269
For Anesthetic Agent Monitoring 269
For FLOW/Paw Monitoring 269
For EEG Monitoring... 269
General Requirements for Connecting Medical Electrical Systems... 270

About this Manual

This Operator’s Manual describes the most common features and functions of the BSM-6301A/K, BSM-6501A/K and BSM-6701A/K bedside monitors.

Related Documentation

The BSM-6301A/K, BSM-6501A/K and BSM-6701A/K Bedside Monitors come with the following manuals in addition to the Operator’s Manual.

Administrator’s Guide

Describes how to install the bedside monitor. It also explains about the password protected settings on the SYSTEM SETUP window and SYSTEM CONFIGURATION screen which only an administrator can change.

User’s Guide, Part I

Gives supplemental information on the operation of the bedside monitor.

User’s Guide, Part II

Describes the features and settings of the monitoring parameters.

Service Manual

Describes information on servicing the bedside monitor. Only qualified service personnel can service the bedside monitor.

Intended Purpose

The Life Scope TR BSM-6301A/K, BSM-6501A/K and BSM-6701A/K bedside monitors are for one patient. The BSM-6301A/K bedside monitors have a 10.4 inch TFT color display, BSM-6501A/K have a 12.1 inch TFT color display, and BSM-6701A/K have a 15 inch TFT color display. All the monitors can display 15 waveforms on the screen.

The bedside monitors are to be installed near the patient. With the basic configuration of the system, ECG, respiration in impedance or thermistor method, SpO_2, NIBP, IBP, temperature, CO_2 and O_2 of all hospital patients can be monitored and alarms are generated.* The monitor is designed so the operator can directly touch the screen from the operator position. The basic configuration of the system is the following units. This manual is based on this configuration.

* Essential performance in EMC standard.

WARNING

Do not use the same monitor for more than one patient at the same time. Do not connect different sensors from different patients to the same monitor.

WARNING

Do not diagnose a patient based only on data acquired by the bedside monitor. Overall judgement must be performed by a physician who understands the features, limitations and characteristics of the bedside monitor and by reading the biomedical signals acquired by other instruments.

- MU-631RA/RK, MU-651RA/RK, MU-671RA/RK main unit
- QI-631P, QI-632P, QI-634P, QI-671P, QI-672P interface
- AY series input unit

Input Unit Model	**AY-631P**	**AY-633P**	**AY-651P**	**AY-653P**	**AY-660P*1**	**AY-661P*1** **AY-671P**	**AY-663P*1** **AY-673P**
No. of MULTI sockets	1	3	1	3	1	1	3
Available parameters using MULTI sockets	RESP (Thermistor), CO_2, SpO_2, IBP, TEMP, BIS, CO, O_2				CO_2, IBP	RESP (Thermistor), CO_2, SpO_2, IBP, TEMP, BIS, CO, O_2	
No. of TEMP sockets	2				1	2	
ECG measurement using 10 electrodes	Yes				No	Yes	
12 lead analysis	Yes				No	Yes	
SpO_2 probe	Masimo		Nellcor		Nihon Kohden		
Dual SpO_2	Yes*2		Yes*3		Yes*4	Yes*5	
NIBP PWTT measurement	No				Yes		
Smart expansion unit	Yes				No	Yes	
Analog ECG							
Analog BP							
HT output							

*1 AY-660P, AY-661P and AY-663P input units are not available for BSM-6000A series.

*2 IF-925P communication cable is required.

*3 IF-919P communication cable is required.

*4 Dual SpO_2 is available when the MULTI socket on the JA-694PA data acquisition unit is used.

*5 JL-500P1 or JL-500P2 SpO_2 adapter is required.

- AA-672P/AA-674P smart expansion unit
- WS-671P recorder module
- SB-671P battery pack

For simplicity, the model number suffix A/G/K is omitted in this manual.

NOTE:
- This monitor must be used by qualified medical personnel with a full knowledge of operating this monitor.
- Upgrade the main unit and each optional unit to the Nihon Kohden recommended software version. Only use the specified configuration of units. If more than one BSM-6000 series bedside monitor is used in the same facility, make sure the bedside monitors have the same software version. If BSM-6000 series monitors with different software versions are used together, correct system operation cannot be guaranteed.
- Only use Nihon Kohden parts and accessories to assure maximum performance from your instrument.

Precautions

General Handling Precautions

- This device is intended for use only by qualified medical personnel.
- Only use Nihon Kohden approved products with this device. Use of non-approved products or in a non-approved manner may affect the performance specifications of the device. This includes, but is not limited to, batteries, recording paper, extension cables, electrode leads, input units and AC power.
- This device must receive expert, professional attention for maintenance and repairs. When the device is not functioning properly, it should be clearly marked to avoid operation while it is out of order.
- This device must not be altered or modified in any way.

EMC Related Caution

This equipment and/or system complies with IEC 60601-1-2 International Standard for electromagnetic compatibility for medical electrical equipment and/or system. However, an electromagnetic environment that exceeds the limits or levels stipulated in IEC 60601-1-2, can cause harmful interference to the equipment and/or system or cause the equipment and/or system to fail to perform its intended function or degrade its intended performance. Therefore, during the operation of the equipment and/or system, if there is any undesired deviation from its intended operational performance, you must avoid, identify and resolve the adverse electromagnetic effect before continuing to use the equipment and/or system.

The following describes some common interference sources and remedial actions:

1. **Strong electromagnetic interference from a nearby emitter source such as an authorized radio station or cellular phone:**
   Install the equipment and/or system at another location. Keep the emitter source such as cellular phone away from the equipment and/or system, or turn off the cellular phone.

2. **Radio-frequency interference from other equipment through the AC power supply of the equipment and/or system:**
   Identify the cause of this interference and if possible remove this interference source. If this is not possible, use a different power supply.

3. **Effect of direct or indirect electrostatic discharge:**
   Make sure all users and patients in contact with the equipment and/or system are free from direct or indirect electrostatic energy before using it. A humid room can help lessen this problem.

4. **Electromagnetic interference with any radio wave receiver such as radio or television:**
   If the equipment and/or system interferes with any radio wave receiver, locate the equipment and/or system as far as possible from the radio wave receiver.

5. **Interference of lightning:**
   When lightning occurs near the location where the equipment and/or system is installed, it may induce an excessive voltage in the equipment and/or system. In such a case, disconnect the AC power cord from the equipment and/or system and operate

the equipment and/or system by battery power, or use an uninterruptible power supply.

6. **Use with other equipment:**
   When the equipment and/or system is adjacent to or stacked with other equipment, the equipment and/or system may affect the other equipment. Before use, check that the equipment and/or system operates normally with the other equipment.

7. **Use of unspecified accessory, transducer and/or cable:**
   When an unspecified accessory, transducer and/or cable is connected to this equipment and/or system, it may cause increased electromagnetic emission or decreased electromagnetic immunity. The specified configuration of this equipment and/or system complies with the electromagnetic requirements with the specified configuration. Only use this equipment and/or system with the specified configuration.

8. **Use of unspecified configuration:**
   When the equipment and/or system is used with the unspecified system configuration different than the configuration of EMC testing, it may cause increased electromagnetic emission or decreased electromagnetic immunity. Only use this equipment and/or system with the specified configuration.

9. **Measurement with excessive sensitivity:**
   The equipment and/or system is designed to measure bioelectrical signals with a specified sensitivity. If the equipment and/or system is used with excessive sensitivity, artifact may appear by electromagnetic interference and this may cause mis-diagnosis. When unexpected artifact appears, inspect the surrounding electromagnetic conditions and remove this artifact source.

If the above suggested remedial actions do not solve the problem, consult your Nihon Kohden representative for additional suggestions.

The CE mark is a protected conformity mark of the European Community. Products with the CE mark comply with the requirements of the Medical Device Directive 93/42/EEC.

BSM-6301 and BSM-6501 (JA-690PA/JA-694PA data acquisition unit, QE-910P BIS processor and QI-320PA wireless LAN station are not connected) comply with International Standard IEC 60601-1-2: 2001 and Amendment 1: 2004 which requires CISPR11, Group 1, Class B. Class B EQUIPMENT is equipment suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

BSM-6301, BSM-6501 (JA-690PA/JA-694PA data acquisition unit, QE-910P BIS processor and QI-320PA wireless LAN station are connected) and BSM-6701 comply with International Standard IEC 60601-1-2: 2001 and Amendment 1: 2004 which requires CISPR11, Group 1, Class A. Class A EQUIPMENT is equipment suitable for use in industrial or light industrial establishments and commercial environment.

BSM-6301 and BSM-6501 (when QE-910P and ZS-900P are connected) are CLASS A

equipment if the equipment complies with IEC 60601-1-2: 2001 36 201.1.5 in the countries which do not have national wireless rule.

In IEC 60601-1-2 Medical Electronic Equipment, Part 1: General Requirements for Safety, 2. Collateral Standard: Electromagnetic compatibility-Requirements and test. Section 36. 202. 2 Radiated radio-frequency electromagnetic fields, PATIENT COUPLED EQUIPMENT and/or SYSTEMS applicable IMMUNITY test methods are under consideration at SC62A/ WG13. The 3 V/m IMMUNITY level may be inappropriate especially when measuring SpO_2 because physiological signals can be much smaller than those induced by a 3 V/m electromagnetic field.

When measuring SpO_2, various interference may produce false waveforms which look like pulse waveforms. SpO_2 value and pulse rate may be measured from these false waveforms, causing the alarm to function improperly.

When installing the monitor, avoid locations where the monitor may receive strong electromagnetic interference such as radio or TV stations, cellular phone or mobile two-way radios.

Other Caution

United States law restricts this product to sale by or on the order of a physician.

Responsibility of the Manufacturer

Nihon Kohden Corporation (NKC) shall warrant its products against all defects in materials and workmanship for one year from the date of delivery. However, consumable materials such as recording paper, ink, stylus and battery are excluded from the warranty.

NKC or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided these products are used as prescribed by the operating instructions given in the user’s guide, operator’s and service manuals.

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident, fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

Conventions Used in this Manual and Instrument

Warnings, Cautions and Notes

Warnings, cautions and notes are used in this manual to alert or signal the reader to specific information.

WARNING

A warning alerts the user to possible injury or death associated with the use or misuse of the instrument.

CAUTION

A caution alerts the user to possible injury or problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument, or damage to other property.

NOTE: A note provides specific information, in the form of recommendations, prerequirements, alternative methods or supplemental information.

Text Conventions in this Manual

- Names of hard keys on the bedside monitor are enclosed in square brackets: [Menu]
- Messages that are displayed on the screen are enclosed in quotation marks: “CHECK ELECTRODES”
- Names of items that are displayed on the screen are enclosed in angle brackets: <SENSITIVITY>

Explanations of the Symbols in this Manual and Instrument

MU-631R/MU-651R/MU-671R Main Unit

Symbol	Description	Symbol	Description
⊙	"On" only for a part of instrument		Network socket
○	"Off" only for a part of instrument		Output terminal
∿	Alternating current		Equipotential terminal
	Battery charging	⚠	Attention, consult operator's manual
	Out of paper	SN	Serial number
	Record		Date of manufacture
🔕	Alarm silence	BIS READY	BIS processor/BISx
⚠	Attention, consult operator's manual	1 2	Battery slot 1/Battery slot 2 (MU-631R only)
	NIBP	ZS	ZS socket
	NIBP interval		CSA mark*
◇	NIBP start	MR	MR unsafe*
▽	NIBP stop	CE 0086	The CE mark** is a protected conformity mark of the European Community. Products marked with this symbol comply with the requirements of the Medical Device Directive 93/42/EEC.
	Menu		
⌂	Home		Products marked with this symbol** comply with the European WEEE directive 2002/96/EEC and require separate waste collection. For Nihon Kohden products marked with this symbol, contact your Nihon Kohden representative for disposal.
	Data input/output		
▶	SD card slot		

* The CSA mark and MR unsafe mark only apply to the MU-631RA/MU-651RA/MU-671RA.

** The CE mark and WEEE mark only apply to the MU-631RK/MU-651RK/MU-671RK.

AY Series Input Unit

Symbol	Description	Symbol	Description
	Defibrillation-proof type CF applied part	SN	Serial number
	Output terminal		Date of manufacture
CE 0086	The CE mark is a protected conformity mark of the European Community. Products marked with this symbol comply with the requirements of the Medical Device Directive 93/42/EEC.	⚠	Attention, consult operator's manual

AA-672P/AA-674P Smart Expansion Unit

Symbol	Description	Symbol	Description
⫞♥⫟	Defibrillation-proof type CF applied part	🏭	Date of manufacture
⚠	Attention, consult operator’s manual	CE 0086	The CE mark is a protected conformity mark of the European Community. Products marked with this symbol comply with the requirements of the Medical Device Directive 93/42/EEC.
SN	Serial number		

QI-631P Interface

Symbol	Description	Symbol	Description
IOIOI	Serial interface (RS-232C socket)	⚠	Attention, consult operator’s manual
|▭|	External display (RGB socket)		

QI-632P Interface

Symbol	Description	Symbol	Description
⇆○	Input/output terminal (USB socket and Multi-link socket)	⚠	Attention, consult operator’s manual
←⊖	Output terminal (Alarm socket)		

QI-634P Interface

Symbol	Description	Symbol	Description
⇆○	Input/output terminal (USB socket and Multi-link socket)	⚠	Attention, consult operator’s manual

QI-671P Interface

Symbol	Description	Symbol	Description
⇆○	Input/output terminal (Multi-link socket)	|▭|	External display (RGB socket)
IOIOI	Serial interface (RS-232C socket)	⚠	Attention, consult operator’s manual
←⊖	Output terminal (Alarm socket)		

QI-672P Interface

Symbol	Description	Symbol	Description
⇆○	Input/output terminal (USB socket and Multi-link socket)	⚠	Attention, consult operator’s manual

WS-671P Recorder Module

Symbol	Description	Symbol	Description
⚠	Attention, consult operator's manual	CE 0086	The CE mark is a protected conformity mark of the European Community. Products marked with this symbol comply with the requirements of the Medical Device Directive 93/42/EEC.
SN	Serial number		
🏭	Date of manufacture		

SB-671P Battery Pack

Symbol	Description	Symbol	Description
♻ Ni-MH	Recycle mark	⑩	Environmental protection use period: 10 years
CE	The CE mark is a protected conformity mark of the European Community. Products marked with this symbol comply with the requirements of the Medical Device Directive 93/42/EEC.	🗑	Products marked with this symbol comply with the European WEEE directive 2002/96/EEC and require separate waste collection. For Nihon Kohden products marked with this symbol, contact your Nihon Kohden representative for disposal.

On screen

Symbol	Description	Symbol	Description
🔕	Alarm silence	→⛁	Accessing to SD card
🔕	Alarm suspended	?⛁	Checking SD card
🔕	All alarms off or vital sign alarm limit off	×⛁	SD card failure
♥	Non-paced	▲ ▼ ◀ ▶	Adjust setting/Scroll data
♥	QRS/pulse sync mark	⊕ ⊖	Zoom in/Zoom out
🫁	Respiration sync mark	⏮ ⏭	Left end/Right end
←🔋1	Battery status	@	Touch panel calibration

General Safety Information

WARNING

Never use the monitor in the presence of any flammable anesthetic gas or high concentration oxygen atmosphere. Failure to follow this warning may cause explosion or fire.

WARNING

When the monitor is used with an electrosurgical unit (ESU), firmly attach the entire area of the ESU return plate. Otherwise, the current from the ESU flows into the electrodes of the monitor, causing electrical burn where the electrodes are attached. For details, refer to the ESU manual.

WARNING

Before defibrillation, all persons must keep clear of the bed and must not touch the patient or any equipment or cord connected to the patient. Failure to follow this warning may cause electrical shock or injury.

WARNING

When performing MRI test, remove all electrodes and transducers from the patient which are connected to this instrument. Failure to follow this warning may cause skin burn on the patient. For details, refer to the MRI manual.

WARNING

After attaching electrodes, probes and sensors on the patient and connecting cables to the bedside monitor, check that there is no error messages and the waveforms and numeric data are appropriately displayed on the screen. If there is an error message, or waveform or numeric data is not appropriate, check the electrodes, probes and sensor attachment, patient condition and settings on the bedside monitor and remove the cause.

WARNING

Never use the monitor in a hyperbaric oxygen chamber. Failure to follow this warning may cause explosion or fire.

WARNING

When performing defibrillation, discharge as far as possible from electrodes, patches and any gel, cream or medicine on the chest of the patient. If there is a possibility that the defibrillator paddle could touch these materials, remove them from the patient. If the defibrillator paddle directly contacts these materials, the discharged energy may cause skin burn to the patient.

WARNING

Do not perform defibrillation when the cables are located between the defibrillator paddles. The discharged energy may be insufficient.

WARNING

Do not allow the conductive part of the connector which is connected to the patient to contact other conductive parts including earth. This causes leakage current and incorrect measurement value and leads to wrong diagnosis.

WARNING

Do not use the same monitor for more than one patient at the same time. Do not connect different sensors from different patients to the same monitor.

WARNING

Do not leave the SD card near the patient or in reach of children.

CAUTION
Only use Nihon Kohden specified electrodes, probes, transducers, thermistors and catheters. Otherwise, the maximum performance from the monitor cannot be guaranteed.

CAUTION
Make sure that the electrodes and cords attached to the patient are properly connected to the monitor. Otherwise, incorrect data may be displayed and lead to wrong diagnosis.

CAUTION
Turn off the power of mobile phones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for devices allowed by the hospital administrator). Radio waves from devices such as mobile phones or small wireless devices may be mistaken as pulse waves and the displayed data may be incorrect.

CAUTION
When the "CONNECTOR OFF" message appears on the screen, check that the connection cords are connected to the sockets properly. The patient cannot be monitored and the alarm does not function while this message is displayed.

CAUTION
The ZS-900P transmitter can only transmit temperature data from 5 to 45°C (41 to 113°F). Be careful when reading the value.

CAUTION
Do not reuse disposable parts and accessories.

CAUTION
After the monitor power is turned on, parameter-related alarms do not function until the parameters are monitored.

CAUTION
When admitting a new patient, first delete all data of the previous patient. Otherwise, the data of the previous patient and new patient will be mixed together.

CAUTION
If fluids are accidentally spilled into the monitor, take the monitor out of service and contact your Nihon Kohden representative. The monitor must be disassembled, cleaned, dried and tested for safety and function.

CAUTION
When using a ZS-900P transmitter, the measurement values and displayed waveform on the bedside monitor and receiving monitor may differ due to timing delay of the display and other factors. Be careful when reading the value and waveform.

CAUTION
The ZS-900P transmitter can only transmit CO_2 data from 0 to 100 mmHg (0 to 13.3 kPa). When the transmitting data is out of this range, the receiving monitor displays it as 100 mmHg. Be careful when reading the value.

NOTE: Operate the monitor on battery power if you cannot confirm the grounding or wiring in your facility.

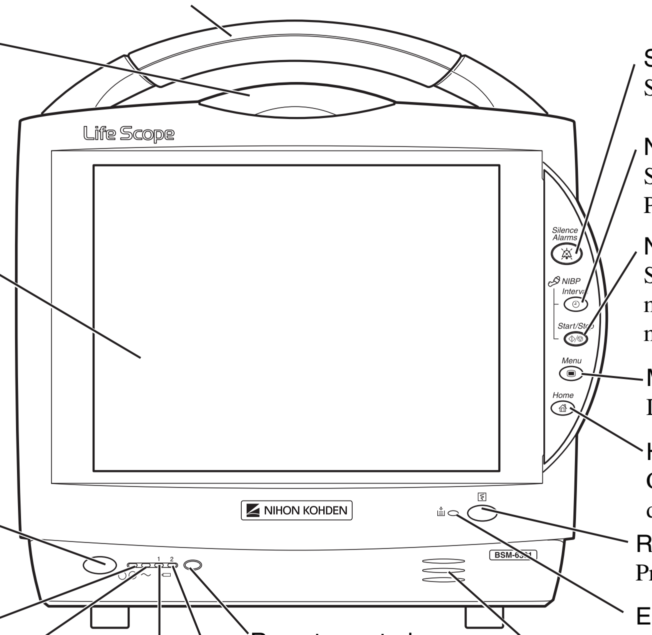
Using External Instruments

WARNING
When connecting an external instrument using an interface or communication cable to the monitor, some alarms and messages from the external instrument might not be displayed on the monitor. When the waveform or data is abnormal, check the alarm and message on the external instrument.

Panel Description

MU-631R Main Unit

Front Panel



Handle
For carrying the monitor.

Alarm indicator
Red or yellow lamp blinks, or yellow or cyan lamps lights according to the alarm settings. Green lamp blinks in synchronization with the patient's QRS or pulse.

Touch screen
Displays monitoring data. Touching a key or data on the screen changes the displayed screen and settings.

Power switch
Press and hold for more than one second to turn the monitor power on. When turning the monitor power off, press and hold for more than three seconds.

Power lamp
Lights when the monitor power is turned on.

AC power lamp
Lights when the power cord is connected between the AC SOURCE socket and AC outlet.

Battery lamp 1
Indicates a battery status of the battery in the battery slot 1.

Remote control sensor
Receives an infrared signal from the remote control.

Battery lamp 2
Indicates a battery status of the battery in the battery slot 2.

Silence Alarms key
Silences the alarm sound.

NIBP Interval key
Selects NIBP measurement mode. Pressing this key changes the mode.

NIBP Start/Stop key
Starts NIBP measurement in selected mode. Pressing the key during measurement stops measurement.

Menu key
Displays the MENU window.

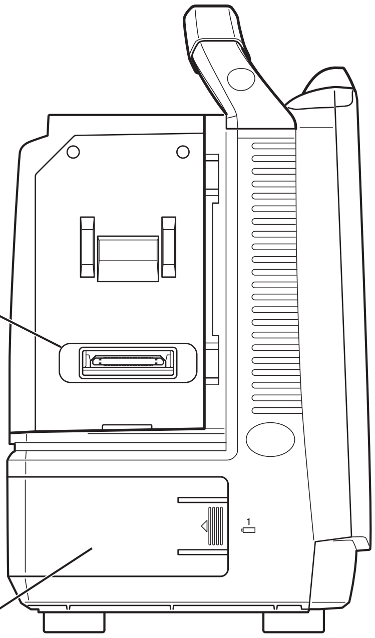
Home key
Closes all opened windows and displays the home screen.

Record/Stop key (option)
Press to start or stop recording.

Error lamp (option)
Blinks when out of paper. Lights when the recorder door is open.

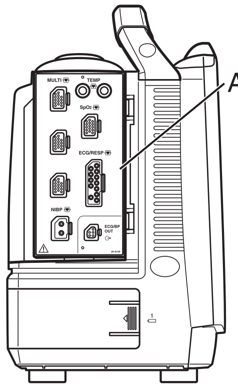
Speaker
For alarm and sync sound.

Left Side Panel

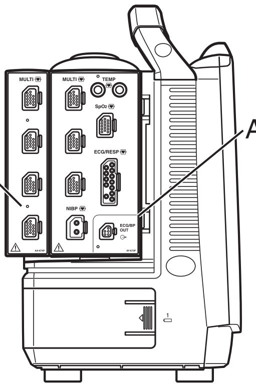


Input unit socket
Connects an AY series input unit.

Battery pack holder 1 (Battery slot 1)
For an SB-671P battery pack.

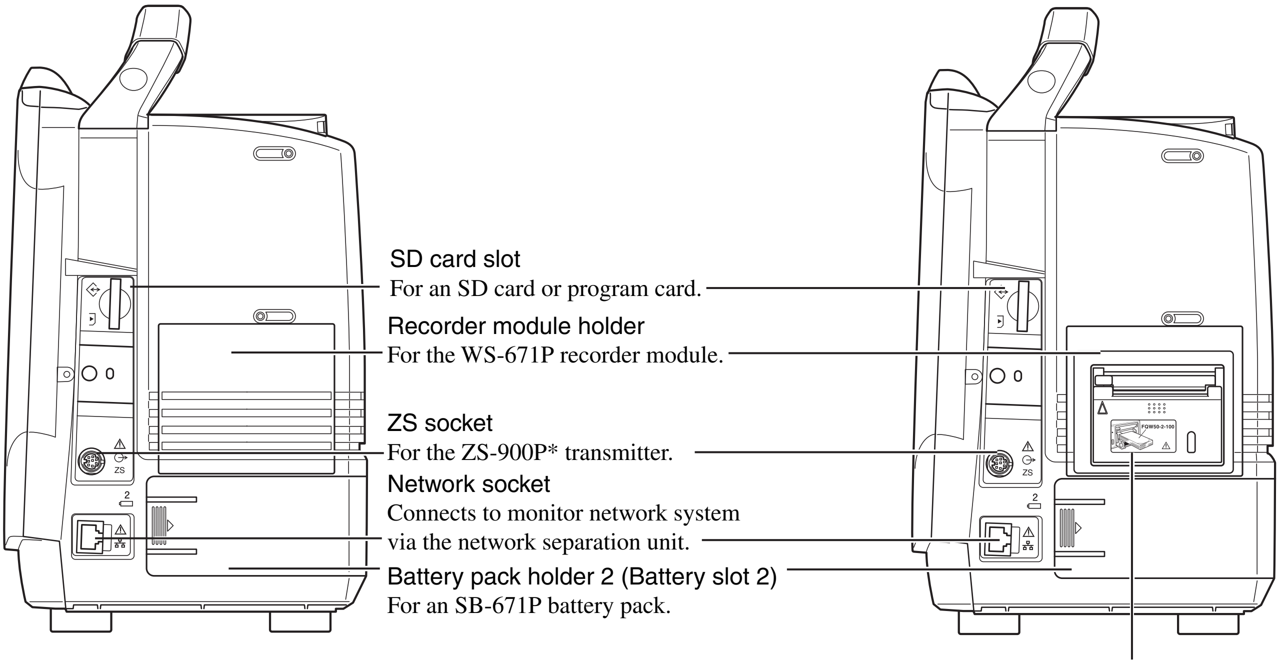


When the AY-673P input unit installed



When the AY-673P input unit and AA-674P smart expansion unit are installed

Right Side Panel



SD card slot
For an SD card or program card.

Recorder module holder
For the WS-671P recorder module.

ZS socket
For the ZS-900P* transmitter.

Network socket
Connects to monitor network system via the network separation unit.

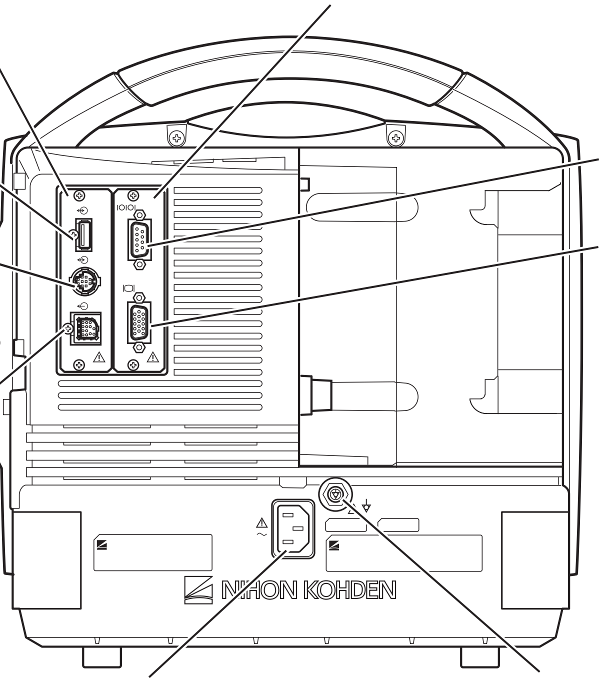
Battery pack holder 2 (Battery slot 2)
For an SB-671P battery pack.

When the WS-671P recorder module is installed

* ZS-900P transmitter is not available for BSM-6000A series.

Rear Panel

Example shows the QI-631P and QI-632P interfaces installed.



QI-632P/QI-634P interface socket
Connects the QI-632P or QI-634P interface.

QI-631P interface socket
Connects the QI-631P interface.

USB socket (QI-632P/QI-634P)
Connects a mouse or bar code reader.

Multi-link socket (QI-632P/QI-634P)
Connects a QF series interface, IF series communication cable or multi-link cable of an external unit.

Alarm socket (QI-632P)
Connects a YJ-672P nurse call cable.

RS-232C socket (QI-631P)
Not available.

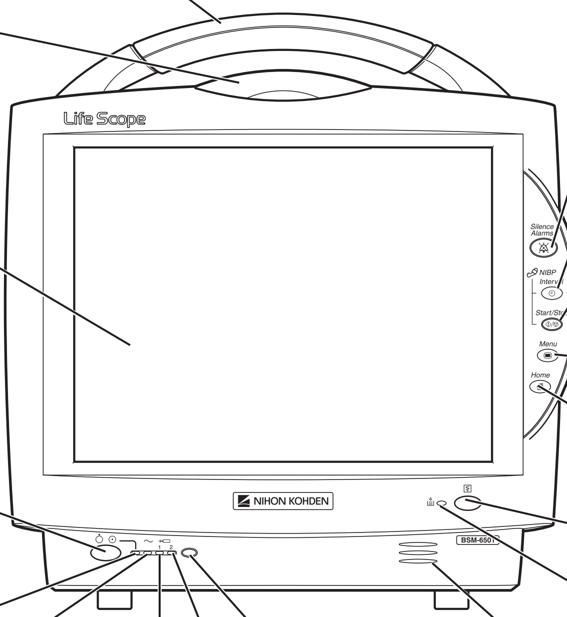
RGB socket (QI-631P)
Outputs the RGB video signal. Connects to the slave display.

AC SOURCE power cord socket
For the AC power cord.

Equipotential grounding terminal
For an equipotential grounding lead.

MU-651R/MU-671R Main Unit

Front Panel



Handle
For carrying the monitor.

Alarm indicator
Red or yellow lamp blinks, or yellow or cyan lamps lights according to the alarm settings. Green lamp blinks in synchronization with the patient's QRS or pulse.

Touch screen
Displays monitoring data. Touching a key or data on the screen changes the displayed screen and settings.

Power switch
Press and hold for more than one second to turn the monitor power on. When turning the monitor power off, press and hold for more than three seconds.

Power lamp
Lights when the monitor power is turned on.

AC power lamp
Lights when the power cord is connected between the AC SOURCE socket and AC outlet.

Battery lamp 1
Indicates a battery status of the battery in the battery slot 1.

Remote control sensor
Receives an infrared signal from the remote control.

Battery lamp 2
Indicates a battery status of the battery in the battery slot 2.

Silence Alarms key
Silences the alarm sound.

NIBP Interval key
Selects NIBP measurement mode. Pressing this key changes the mode.

NIBP Start/Stop key
Starts NIBP measurement in selected mode. Pressing the key during measurement stops measurement.

Menu key
Displays the MENU window.

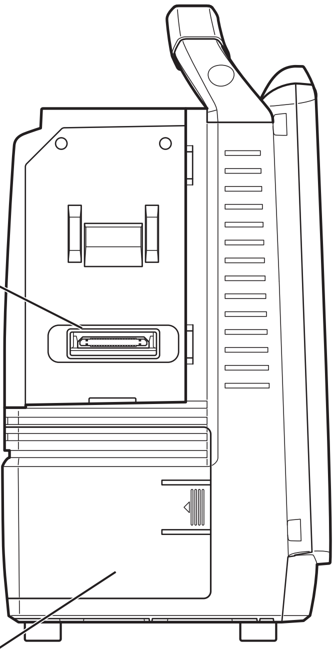
Home key
Closes all opened windows and displays the home screen.

Record/Stop key (option)
Press to start or stop recording.

Error lamp (option)
Blinks when out of paper. Lights when the recorder door is open.

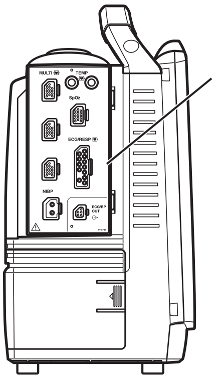
Speaker
For alarm and sync sound.

Left Side Panel



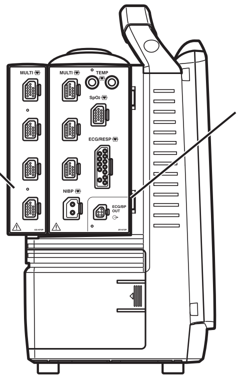
Input unit socket
Connects an AY series input unit.

Battery pack holder
For an SB-671P battery pack.



AY-673P

When the AY-673P input unit installed

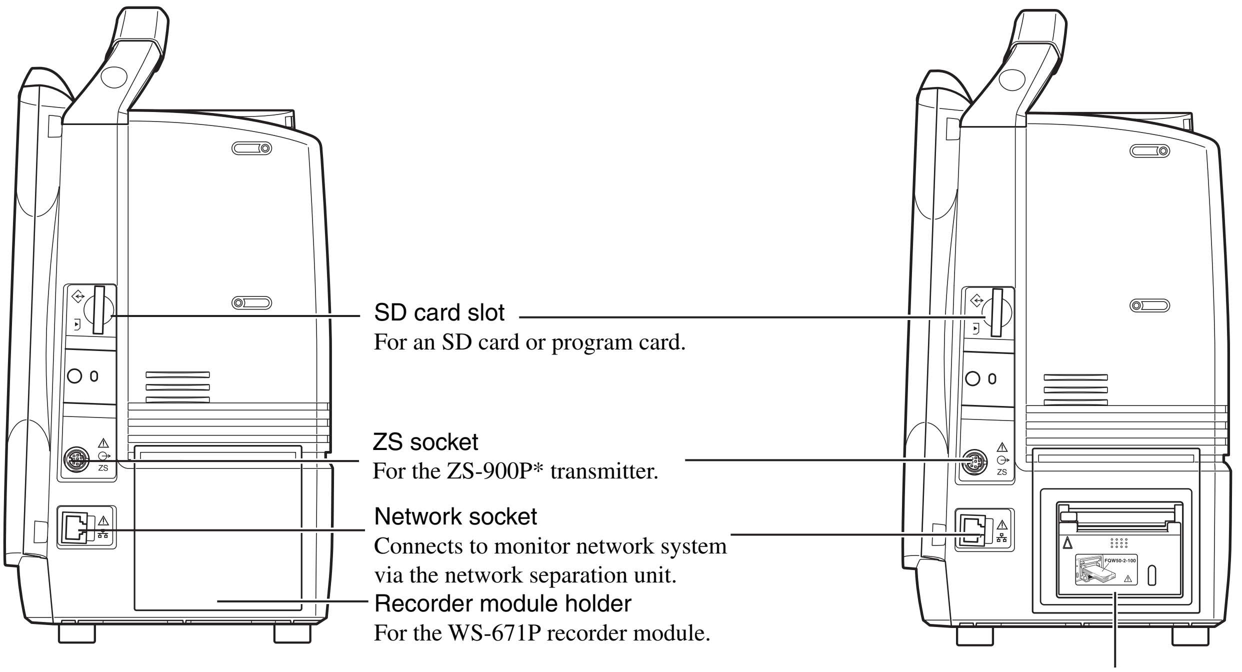


AA-674P

AY-673P

When the AY-673P input unit and AA-674P smart expansion unit are installed

Right Side Panel



SD card slot
For an SD card or program card.

ZS socket
For the ZS-900P* transmitter.

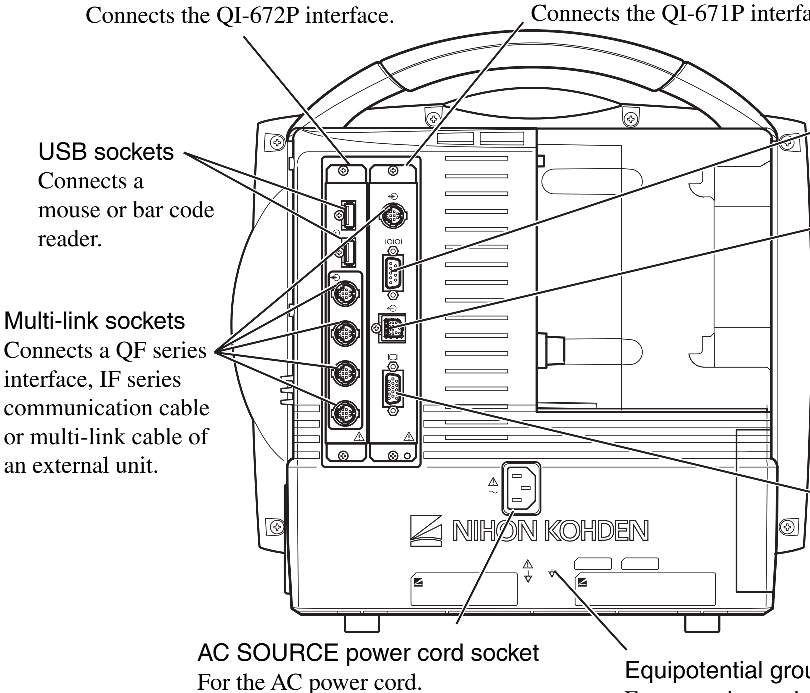
Network socket
Connects to monitor network system via the network separation unit.

Recorder module holder
For the WS-671P recorder module.

* ZS-900P transmitter is not available for BSM-6000A series.

When the WS-671P recorder module is installed

Rear Panel



QI-672P interface socket
Connects the QI-672P interface.

QI-671P interface socket
Connects the QI-671P interface.

USB sockets
Connects a mouse or bar code reader.

Multi-link sockets
Connects a QF series interface, IF series communication cable or multi-link cable of an external unit.

RS-232C socket
Not available.

Alarm socket
Connects a YJ-672P nurse call cable.

RGB socket
Outputs the RGB video signal. Connects to the dual display or slave display.

AC SOURCE power cord socket
For the AC power cord.

Equipotential grounding terminal
For an equipotential grounding lead.

AY-631P/AY-633P/AY-651P/AY-653P/AY-660P/AY-661P/AY-663P/AY-671P/AY-673P Input Unit

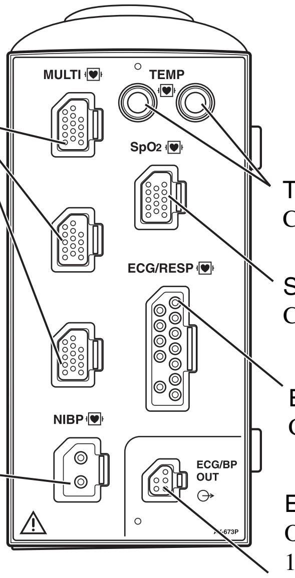
Front Panel

AY-660P: One TEMP socket, one MULTI socket, no ECG/BP OUT socket

AY-631P/AY-651P/AY-661P/AY-671P: Two TEMP sockets, one MULTI socket

AY-633P/AY-653P/AY-663P/AY-673P: Two TEMP sockets, three MULTI sockets

Example is AY-673P input unit.



MULTI socket
Connects to the connection cord of the parameter to be monitored (IBP, temperature, CO, CO_2, O_2, respiration by thermistor method, SpO_2-2 (AY-661P/663P/671P/673P only) or BIS). The type of parameter is automatically recognized.

NIBP socket
Connects to the air hose.

TEMP socket
Connects to the temperature probe cord.

SpO_2 socket
Connects to the SpO_2 connection cord.

ECG/RESP socket
Connects to the ECG connection cord.

ECG/BP OUT socket
Outputs 100 mmHg/V IBP waveform and 1 mV/V ECG waveform and heart rate trigger by using the YJ-910P or YJ-920P ECG/BP output cable. These analog signals can be used as the synchronization signal for other equipment, such as IABP.

WARNING

When performing defibrillation during cardiac output monitoring, never touch the CO connection cord. The discharged energy may cause electrical shock or injury.

CAUTION

When using the output signal from the monitor as the synchronization signal for other equipment such as an IABP (intra-aortic balloon pump) or defibrillator:

- Set the timing of the IABP by checking the waveform on the IABP screen.
- Check the condition of the bedside monitor at all times. The output signal may become unstable.
- Check that the delay time of the output signal is within the range of the connected equipment.

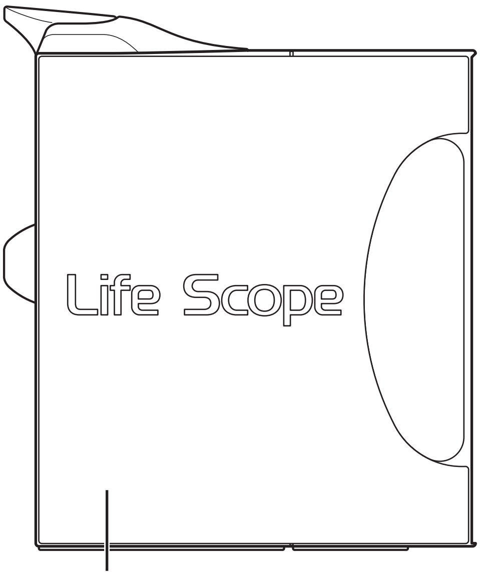
CAUTION

Only a Nihon Kohden defibrillator can use the output signal from the monitor as a synchronization signal. Check that the delay time of the output signal (heart rate trigger 20 ms maximum) is within the range of the connected defibrillator.

NOTE:

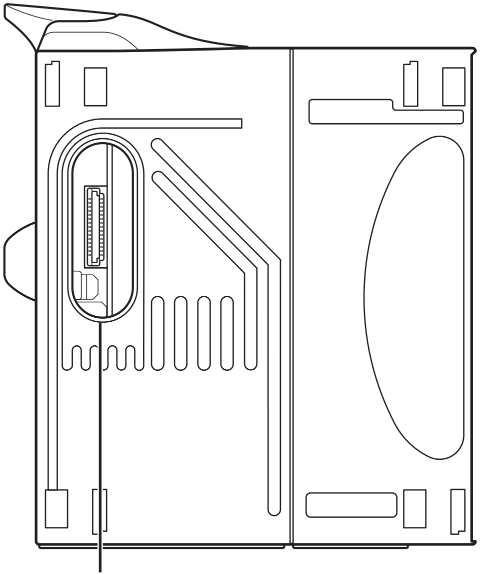
- When using an IBP waveform as a synchronization signal for other equipment, connect the IBP line to the MULTI socket on the input unit. The IBP waveform that is used for the synchronization signal depends on the “IBP ANALOG OUT” setting in the SYSTEM SETUP window.
  - When “IBP ANALOG OUT” is set to “FIXED POSITION”:
    The IBP line connected to the top MULTI socket on the input unit is used.
  - When “IBP ANALOG OUT” is set to “HIGHEST PRIORITY LABEL” :
    When more than one IBP waveform is acquired, the IBP waveform of the highest priority label is used.
    IBP label priority:
    ART > ART2 > RAD > DORS > AO > FEM > UA > LVP > P1 > P2 > P3 > P4 > P5 > P6 > P7
- Analog ECG, analog BP and heart rate trigger output are not available when an AY-660P input unit is used.
- The output signal from the ECG/BP OUT socket may become unstable in the following conditions.
  - Electrode is dry or detached.
  - Electrode lead is damaged or disconnected from the electrode.
  - Electrode lead is pulled.
  - AC interference or EMG noise superimposed.
  - Air bubbles or blood clog in the circuit for monitoring IBP.
  - Cord or cable is disconnected or damaged.
- All instruments which are to be connected to the ECG/BP OUTPUT socket must use a YJ-910P or YJ-920P ECG/BP output cable and comply with the IEC 60601-1 safety standard for medical equipment.

Left Side Panel



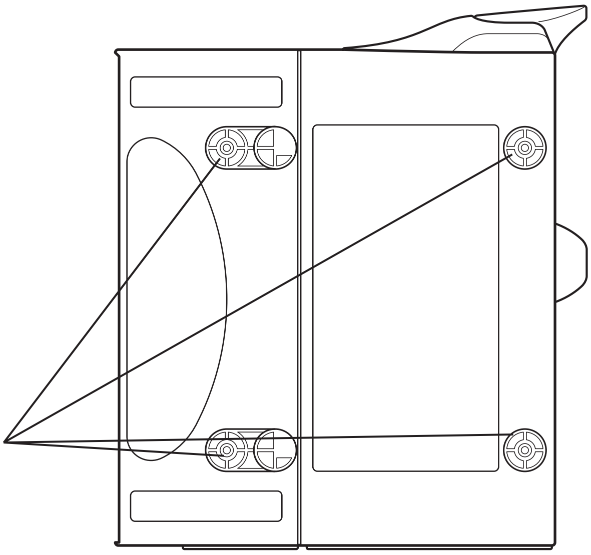
Side panel
Remove to attach an AA-672P or AA-674P smart expansion unit.

When the side panel is removed



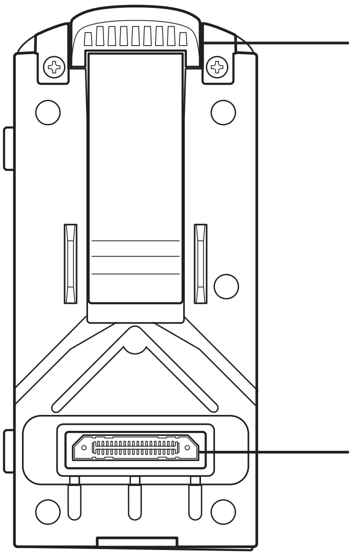
Smart expansion unit socket
Connects an AA-672P or AA-674P smart expansion unit.

Right Side Panel



Tabs
Match the tabs on the input unit to the slots on the bedside monitor.

Rear Panel



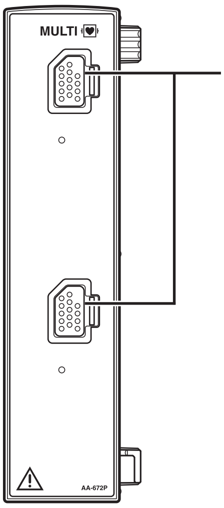
Lock release lever
Lift up the lever to remove the input unit from the bedside monitor.

Input unit socket
For connecting a bedside monitor.

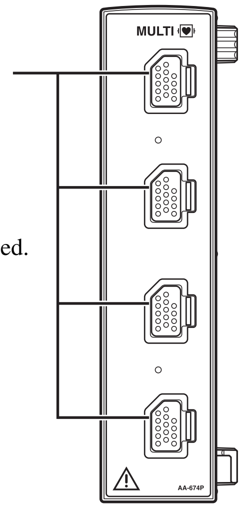
AA-672P/AA-674P Smart Expansion Unit

Front Panel

AA-672P

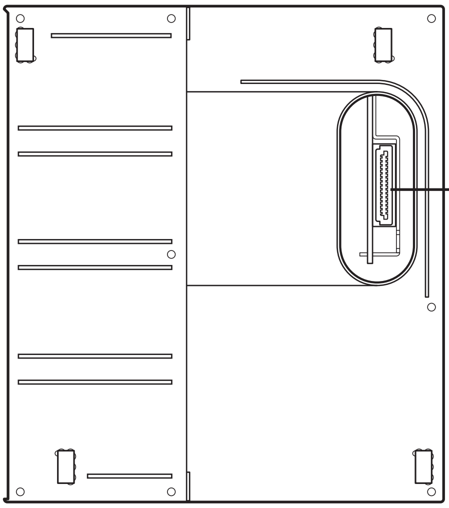


AA-674P



MULTI socket
Connects to the connection cord of the parameter to be monitored (IBP, temperature, CO, CO_2, O_2, respiration by thermistor method, SpO_2-2 (AY-661P/663P/671P/673P only) or BIS). The type of parameter is automatically recognized.

Right Side Panel



Connector
Connects an AY-631P, AY-633P, AY-651P, AY-653P, AY-661P, AY-663P, AY-671P or AY-673P input unit.

Installation

General

The monitor must be installed by qualified personnel. Details are in the Administrator's Guide.

WARNING

Only use the provided power cord. Using other power cords may result in electrical shock or injury to the patient and operator.

WARNING

When several medical instruments are used together, ground all instruments to the same one-point ground. Any potential difference between instruments may cause electrical shock to the patient and operator.

WARNING

Connect only the specified instrument to the monitor and follow the specified procedure. Failure to follow this warning may result in electrical shock or injury to the patient and operator, and cause fire or instrument malfunction.

WARNING

- Do not install the monitor and optional units above the patient.
- Only use the specified tools or equipment when installing the monitor and units. Failure to follow this warning may result in the monitor or unit falling and injuring the patient.

CAUTION

Only use the specified stand, cart or equipment for installing the monitor and instruments. Using non-specified equipment may result in the instruments falling and causing injury.

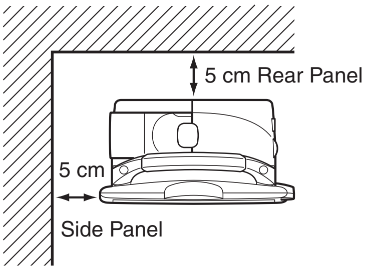
CAUTION

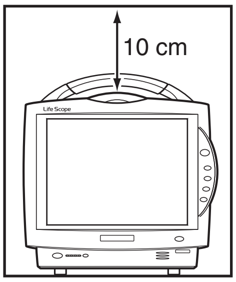
When not using the specified cart, carefully set the monitor to prevent it from falling off or tipping over.

CAUTION

Before connecting or disconnecting instruments, make sure that each instrument is turned off and the power cord is disconnected from the AC socket. Otherwise, the patient or operator may receive electrical shock or injury.

Make sure that there is more than 5 cm of space between the monitor and the wall for adequate ventilation. When the monitor is surrounded, make sure that there is about 10 cm of space above the monitor for ventilation so that the operating temperature does not exceed 40°C (104°F).





Grounding the Monitor

When more than one electrical instrument is used, there may be electrical potential difference between the instruments. The potential difference between the instruments may cause current to flow to the patient connected to the instruments, resulting in electrical shock (micro shock).

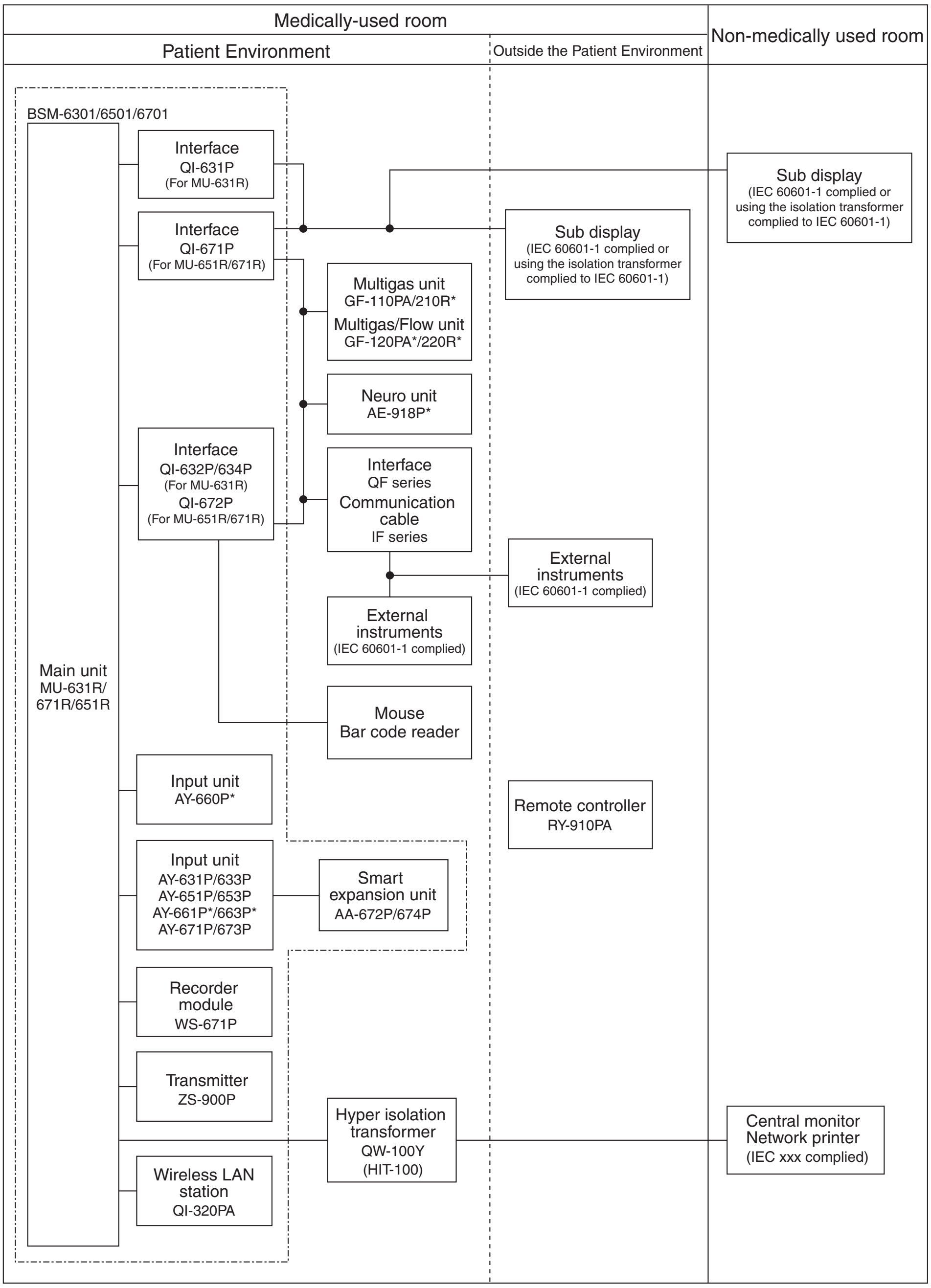
When equipotential grounding is required, connect the equipotential ground terminal on the instrument to the equipotential ground terminal on the wall (equipotential grounding system) with the equipotential grounding lead (potential equalization conductor).

NOTE:

- For details on connecting an external instrument to the monitor, contact your Nihon Kohden representative.
- Leakage current may increase when interconnecting many medical instruments to the monitor.

Environment for External Instruments

Use external instruments in the following environment.


Medically-used room
Patient Environment
Outside the Patient Environment
Non-medically used room
BSM-6301/6501/6701
Interface
QI-631P
(For MU-631R)
Interface
QI-671P
(For MU-651R/671R)
Multigas unit
GF-110PA/210R*
Multigas/Flow unit
GF-120PA*/220R*
Neuro unit
AE-918P*
Interface
QI-632P/634P
(For MU-631R)
QI-672P
(For MU-651R/671R)
Interface
QF series
Communication cable
IF series
External instruments
(IEC 60601-1 complied)
External instruments
(IEC 60601-1 complied)
Main unit
MU-631R/
671R/651R
Mouse
Bar code reader
Input unit
AY-660P*
Input unit
AY-631P/633P
AY-651P/653P
AY-661P*/663P*
AY-671P/673P
Smart expansion unit
AA-672P/674P
Recorder module
WS-671P
Transmitter
ZS-900P
Wireless LAN station
QI-320PA
Hyper isolation transformer
QW-100Y
(HIT-100)
Sub display
(IEC 60601-1 complied or using the isolation transformer complied to IEC 60601-1)
Sub display
(IEC 60601-1 complied or using the isolation transformer complied to IEC 60601-1)
Remote controller
RY-910PA
Central monitor
Network printer
(IEC xxx complied)

* These units are not available for BSM-6000A series.

Warnings and Cautions for Connecting the Monitor to a Network

WARNING

Install all network devices, including printer and hubs, outside the patient environment (IEC 60601-1-1). If they are installed inside the patient environment, the patient or operator may receive electrical shock or injury. For installation, contact your Nihon Kohden representative.

WARNING

Connect the monitor to network as specified. Otherwise the patient and operator may receive electrical shock or injury. To connect the network, contact your Nihon Kohden representative.

WARNING

Do not use a damaged network cable. The patient or operator may receive electrical shock when the damaged part is touched.

CAUTION

When the monitor is connected to a central monitor network, set the Bed Name (Bed ID) and Group Name on the monitor. Otherwise, the default settings are used for the bed name and group name and the bed may be incorrectly identified on the central monitor.

WARNING

Check the software version number of the monitor before connecting it to the network. Different software versions have different communication methods. More than one communication method in a network may cause communication failure. For details, refer to the Network and System Installation Guide.

WARNING

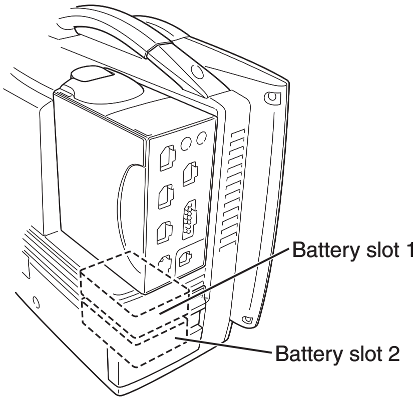
In a network where this monitor is connected, connect only the specified instruments. Unspecified instruments may cause electrical shock or injury to the patient and operator or cause instrument malfunction, instrument stop, or data loss.

CAUTION

The network must be managed by the network administrator. Make sure that each monitor in the network has a different IP address. Otherwise, data communication cannot be performed properly. When adding a monitor to an already operating network, set the IP address on the monitor before connecting the monitor to the network.

Inserting and Removing the Battery Packs

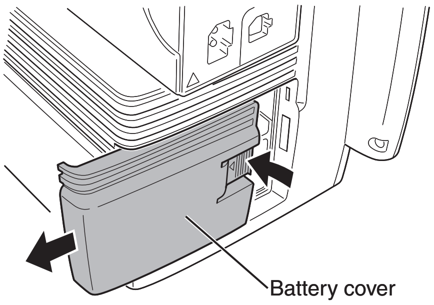
This monitor can hold two battery packs. Insert the battery pack to the battery slot 1 or/and battery slot 2.


Battery slot 1
Battery slot 2

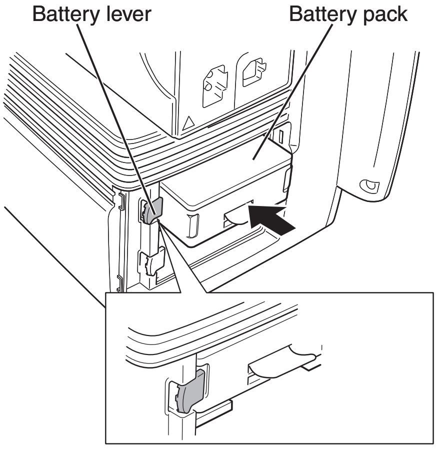
NOTE:

- Only use the SB-671P battery pack.
- The procedure for inserting and removing the battery packs is the same for BSM-6301 and BSM-6501/BSM-6701 bedside monitors even though the battery slot position and battery cover shape are different.

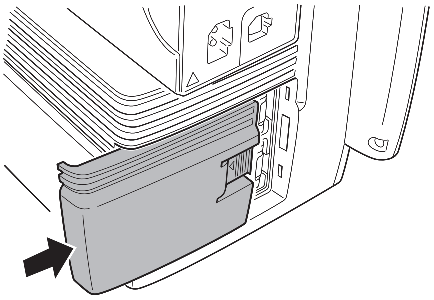
Inserting the Battery Pack


Battery cover

1. Remove the battery cover by pressing the tab on the battery cover and slide the cover off.

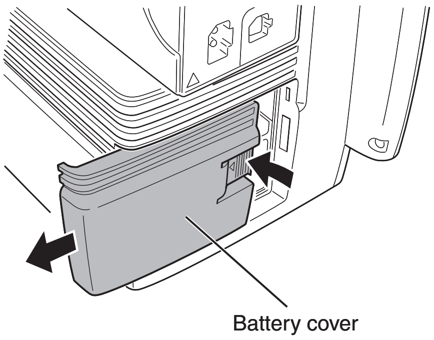

Battery lever
Battery pack

2. Insert the battery pack with the label (black) facing up in the battery slot.

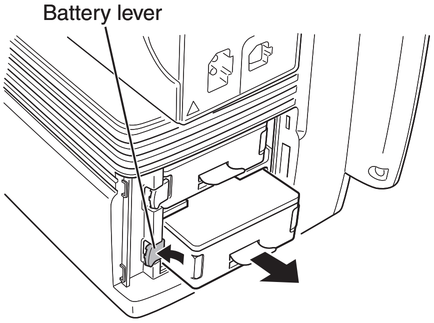


3. Attach the battery cover.

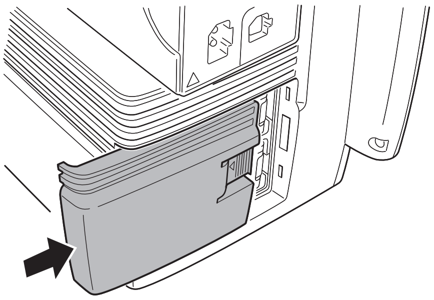
Removing the Battery Pack



1. Remove the battery cover by pressing the tab on the battery cover and slide the cover off.



2. Press the battery lever to release the lock.
3. Pull out the battery pack from the battery slot.

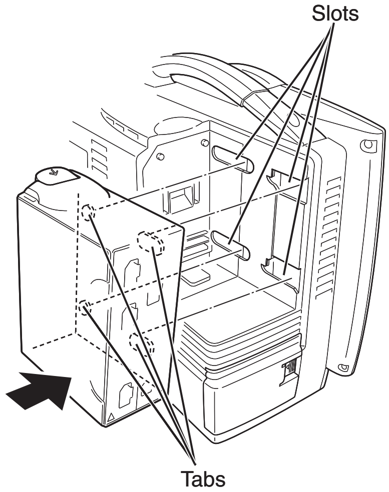


4. Attach the battery cover.

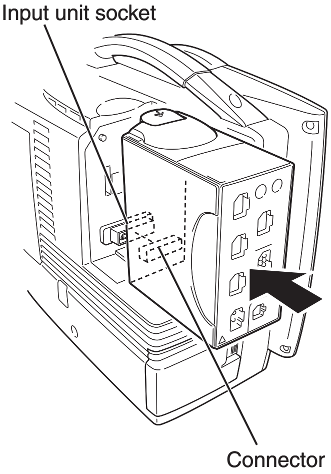
Inserting and Removing the Input Unit

The input unit can be inserted or removed from the monitor. When the patient is changed or moved to a different location, insert or remove the input unit.

Inserting the Input Unit



1. Put the input unit into the rear of the monitor so that the four tabs go into the four slots.

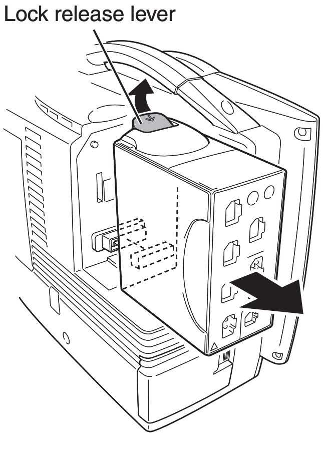


2. Slide the input unit all the way into the monitor until it clicks into place.

Removing the Input Unit

CAUTION

When inserting or removing the input unit from the monitor, be careful not to drop it.



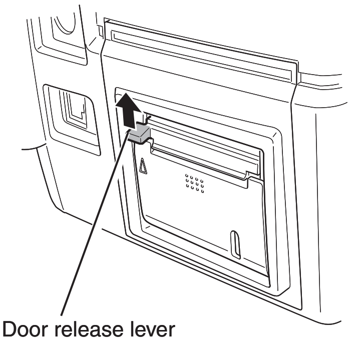
Slide out the input unit while pulling up the lock release lever.

Loading Recording Paper

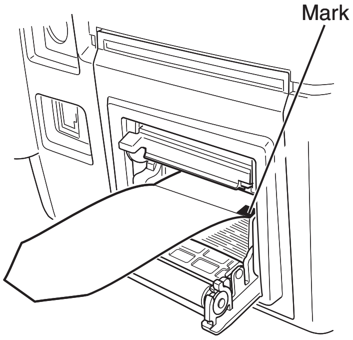
When using the WS-671P recorder module, load the recording paper as follows.

CAUTION

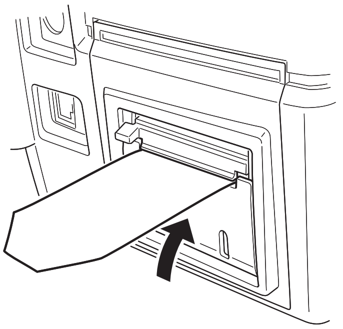
Do not touch the thermal head inside the recorder module. The thermal head may be damaged by static electricity or become dirty and cause printing failure.



1. Move the door release lever in the direction of the arrow (△) to release the lock.



2. Open the recorder door. Set the recording paper (FQW50-2-100) inside the recorder so that the detection mark (small black square on corner) of the paper is on the right side.



3. Draw out one page of paper toward you and close the recorder door. If the out of paper lamp is still lit, the recorder door is not closed properly.

Turning the Monitor On or Off

Turning the Monitor On

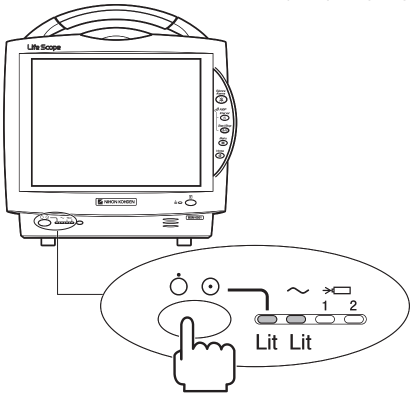
The monitor can operate on either battery or AC power. When the monitor is installed and the power cord is connected, the AC power lamp lights. When a battery pack is installed and the power cord is disconnected or there is a sudden power failure, the monitor automatically switches to battery power. The monitor can operate for about 90 minutes (BSM-6301/BSM-6501) or 60 minutes (BSM-6701) with a new fully charged battery pack when:

- Used in normal temperature.
- Recorder is stopped.
- No alarm occurs.
- Monitoring ECG, respiration (impedance) and SpO_2.
- <POWER SAVING MODE> on the SYSTEM SETUP window is set to ON.
- <SYNC SOUND VOLUME> on the VOLUME window is set to OFF.
- NIBP measurement interval is 15 minutes.
- QI-671P and QI-672P interfaces or QI-631P and QI-632P or QI-634P interfaces are installed in the monitor.

Check Before Turning On the Power

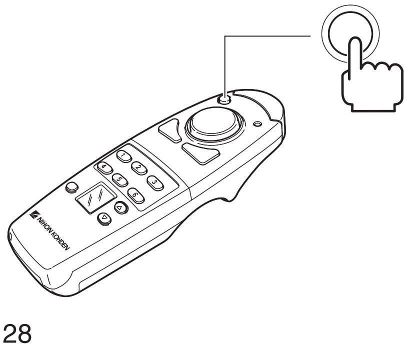
Check the following items before turning on the power.

- Enough electrodes and electrode leads are ready.
- Cleaned and sterilized sensors and transducers are ready.
- Power cord is connected properly.
- Equipotential grounding lead is connected properly when equipotential grounding is required.
- All cables are connected properly.
- Enough recording paper in the recorder (when using an optional recorder).
- Fully charged battery pack is installed in the monitor in case of a sudden power failure.
- No scratches, damage or dirt on the monitor.
- No damage to the keys and panels.
- No damage to the power cord.
- No damage to the electrode leads, transducers, probes and cables.
- The monitor is not in a wet place.



NOTE: When the AC power lamp is not lit, check the power cord connection. The AC power lamp does not light when there is not enough current to each unit.

When the power cord is connected between the bedside monitor and AC outlet and the AC power lamp lights, press the [Power] switch on the front panel to turn the power on. The power lamp and the AC power lamp light and self check starts. When the check is complete, the home screen appears.



NOTE: Even though the position of symbol marks for the lamps are different on BSM-6301 and BSM-6501/BSM-6701 bedside monitors, the function and the position of lamps are the same.

The power can also be turned on by pressing the [POWER] button on the remote control.

CAUTION

When the monitor is turned on, check that a single beep sounds and the red, yellow, cyan and green alarm indicator lamps blink once. This shows that the alarm is functioning properly.

When the monitor power is turned on, alarms are suspended while the monitor is waiting for the electrodes and probe to be attached to the patient. The monitoring starts when the connection cord is connected to the socket on the monitor and the electrodes or probe are attached to the patient. The alarm activates when one of the following occurs:

- at least one parameter is measured and a value is displayed (when AUTO is selected for <ALARM ACTIVATION DELAY> on the ALARM window of the SYSTEM SETUP window)
- ECG, SpO_2 or IBP is continuously monitored for the selected time (when 1 min, 2 min or 3 min is selected for <ALARM ACTIVATION DELAY>)
- NIBP is measured (when 1 min, 2 min or 3 min is selected for <ALARM ACTIVATION DELAY>)

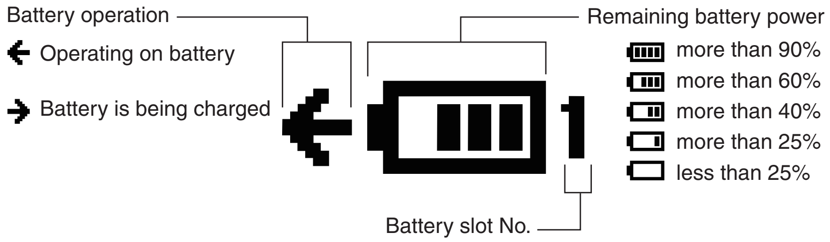
When <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON and the monitor power is turned on more than 30 minutes after turning the power off, the stored data in the monitor is deleted. When the monitor is turned on in less than 30 minutes after turning power off, the stored data is not deleted and monitoring continues. When <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to OFF, the message appears asking whether monitoring a new patient or not. The factory default setting is ON.

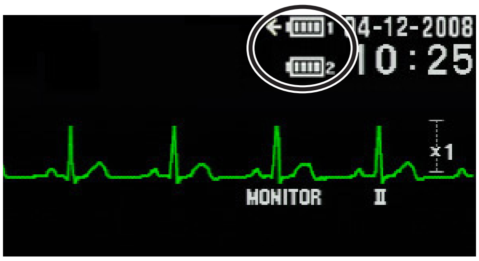
Check After Turning On the Power and During Monitoring

To start monitoring safely and properly, check the following items after turning on the power. If any problem is detected, take the proper countermeasure according to the troubleshooting and maintenance sections.

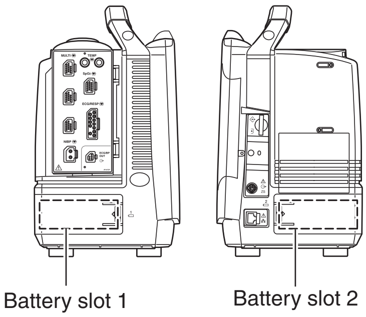
- There is no fire, smoke or smell.
- The monitor is not too hot.
- The power lamp and other lamps light.
- Alarm indicators (red, yellow, cyan and green lamps) blink once and a beep sounds.
- The start up screen and the home screen appears.
- No error message is displayed on the screen.
- The time on the screen is correct.
- The monitor does not affect surrounding equipment.
- The data and waveforms are displayed properly.
- Keys and switches operate properly.
- The touch keys function properly and the key clicking sound is generated.
- Alarm functions properly.
- Alarm sound can be heard.
- Alarm sound volume setting is appropriate.
- There is no trouble in recording (when using an optional recorder).
- Sound can be heard from the monitor.

Power and Battery Status Indications

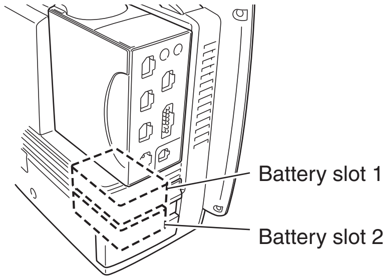

Battery operation
Operating on battery
Battery is being charged
Remaining battery power
more than 90%
more than 60%
more than 40%
more than 25%
less than 25%
1
Battery slot No.


1
2
4-12-2008
10:25
x1
MONITOR
II

BSM-6301


Battery slot 1
Battery slot 2

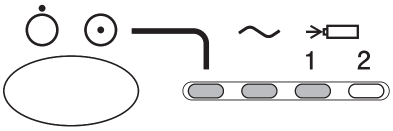
BSM-6501/BSM-6701


Battery slot 1
Battery slot 2

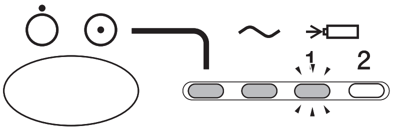
Power and battery status are indicated by four lamps on the bedside monitor. A discharged battery is also indicated by battery marks, screen message and alarm.

NOTE:

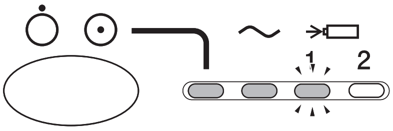
- When charging the battery pack with the monitor power turned off, check that the power lamp and battery charging lamp light. If the lamps do not light even when the power cord is connected and the battery pack is inserted, turn the power on, check that the battery charging lamp is blinking or lit, then turn the power off.
- Even though the position of symbol marks for the lamps are different on BSM-6301 and BSM-6501/BSM-6701 bedside monitors, the function and the position of lamps are the same.



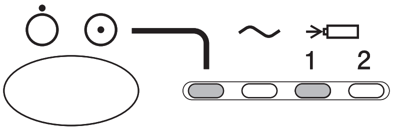
- Operating on AC power and battery pack is fully charged or there is no battery
  Power lamp: Lit
  AC power lamp: Lit
  Battery lamp 1: Lit or off
  Battery lamp 2: Lit or off



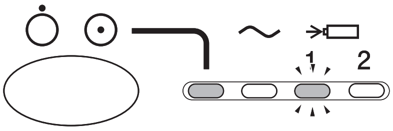
- Operating on AC power and battery pack is being charged
  Power lamp: Lit
  AC power lamp: Lit
  Battery lamp 1: Slow blinking (once every 2 seconds) or off
  Battery lamp 2: Slow blinking (once every 2 seconds) or off



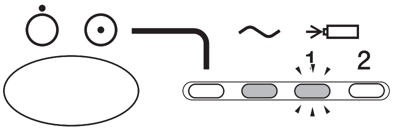
- Operating on AC power when battery pack is damaged
  Power lamp: Lit
  AC power lamp: Lit
  Battery lamp 1: Rapid blinking (4 times per second) or off
  Battery lamp 2: Rapid blinking (4 times per second) or off



- Operating on battery power
  Power lamp: Lit
  AC power lamp: Off
  Battery lamp 1: Lit* or off
  Battery lamp 2: Lit* or off
  * When two battery packs are used and when the battery pack which is not used is fully charged



- Operating on battery power and battery pack is damaged
  Power lamp: Lit
  AC power lamp: Off
  Battery lamp 1: Rapid blinking (4 times per second) or off
  Battery lamp 2: Rapid blinking (4 times per second) or off
  Screen indication: "BATTERY WEAK" message
  Alarm indication: Continuous "bing bong" sound and blinking yellow alarm



- No monitoring and charging battery pack
  Power lamp: Off
  AC power lamp: Lit
  Battery lamp 1: Slow blinking (once every 2 seconds) or off
  Battery lamp 2: Slow blinking (once every 2 seconds) or off

Battery Pack Handling and Operation

WARNING

- Never short-circuit the + and – terminals on the battery pack. It may cause overheating and fire.
- Keep the battery pack away from fire. It may explode.
- Do not damage, disassemble, drop or give impact to the battery pack.
- Never use the battery pack on unspecified instruments.
- Never charge the battery pack on unspecified instruments.
- Never install the battery pack with the wrong polarity.
- Keep the battery pack away from patients.

CAUTION

Do not expose the battery pack to direct sunlight or leave in a high temperature place. The lifetime of the battery pack may be shortened, the performance of the battery pack may be degraded and the battery pack may leak.

WARNING

If the battery pack is damaged and the substance inside the battery pack contacts the eyes or skin, wash immediately and thoroughly with water and see a physician. Never rub your eyes, because you may lose your eyesight.

WARNING

- Do not immerse the battery pack in water. The battery pack may heat up and rust and the substance inside the battery pack may leak.
- Do not leave the battery pack unused for more than about two years. The battery pack may leak.

CAUTION

Do not use a battery pack with a damaged cover. The operator may receive electrical shock.

CAUTION

Do not tilt the monitor when removing the battery pack from the monitor. If the lock release lever is lifted while the monitor is tilted, the battery pack falls out of the monitor and may injure the patient or operator.

CAUTION

Do not leave the battery pack near the patient or in reach of children.

CAUTION

Do not use a battery pack which is past the expiration date written on the label.

CAUTION

Do not subject the battery pack to a strong mechanical shock.

CAUTION

Use the battery pack between 10°C (50°F) and 40°C (104°F). Temperatures out of this range affect the working of the battery.

CAUTION

Before disposing of the battery pack, check with your local solid waste officials for details in your area for recycling options or proper disposal. The battery pack is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery pack into the municipal waste stream.

NOTE: Be careful when handling the fully charged battery pack. The battery pack heats up to about 60°C (140°F).

Battery Pack Handling Procedures

- Always place a battery pack in the monitor. This charges it so that you will always have a fully charged battery pack ready.
- Fully recharge the battery pack before using it for the first time or after storing it for over a month. When the battery pack is not used, it self-discharges.
- Replace the battery pack with a new one every year. This is because the battery pack is a chemical product which gradually deteriorates whether or not it is used.
- Store the battery packs under the following conditions.

Temperature:	–20 to +60°C (–4 to +140°F) (within 30 days)
	–20 to +45°C (–4 to +113°F) (within 90 days)
	–20 to +35°C (–4 to +95°F) (more than 90 days)
Humidity:	20 to 85% RH (noncondensing)

When Not Using the Monitor or Battery Pack

- When the monitor is not used for a long time, remove the battery pack. When a charged or discharged battery pack is left inside the monitor with the power cord unplugged, the battery pack self-discharges and deteriorates.
- When a battery pack is not used, fully charge it before storage. When a battery pack is not used for over one month, fully charge it once every six months.

When the “BATTERY WEAK” Message Appears

Operate the monitor on AC power and/or replace the battery pack when the “BATTERY WEAK” message appears.

When the “BATTERY WEAK” message appears, the remaining battery power is less than 25%. The yellow alarm lamp lights with a continuous “bing bong” sound.

If no AC or battery power is supplied to the monitor, there is no measurement and patient data such as trend data may be lost.

Charging the Battery Pack

The battery pack can be charged by the monitor. It takes about 10 hours to charge one battery pack during monitoring and 6 hours to charge two battery packs when not monitoring.

NOTE: The new battery pack is not charged. Charge the battery pack before use.

The monitor can operate for about 90 minutes (BSM-6301/BSM-6501) or 60 minutes (BSM-6701) with a new fully charged battery pack when:

- Used in normal temperature
- Recorder is stopped
- No alarm occurs
- Monitoring ECG, respiration (impedance) and SpO_2
- <POWER SAVING MODE> on the SYSTEM SETUP window is set to ON.
- <SYNC SOUND VOLUME> on the VOLUME window is set to OFF.
- NIBP measurement interval is 15 minutes.
- QI-671P and QI-672P interfaces or QI-631P and QI-632P or QI-634P interfaces are installed in the monitor.

CAUTION

When charging the battery pack, keep the ambient temperature at approximately 20°C to maintain the optimal battery operation time. If the battery pack is charged at less than 10°C (50°F) or more than 30°C (86°F), the maximum battery operation time will be 20% to 30% less than the optimal operation time.

Charging in the Monitor

Normal charging

During AC operation, the battery pack is automatically charged without interrupting monitoring. It takes approximately 10 hours of continuous charging to fully charge a battery pack.

Fast charging

It takes 6 hours of continuous charging to fully charge two battery packs when not monitoring. When installing two battery packs, the monitor can charge the two battery packs at the same time.

After continuous charging, the monitor automatically switches to trickle charging mode to keep the battery pack fully charged. Trickle charging is necessary because the battery pack can self-discharge even when it is not in use.

NOTE: Do not disconnect the power cord from the monitor during battery charging.

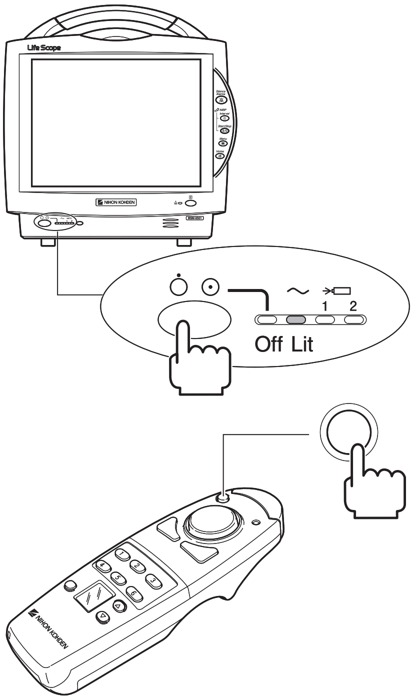
Monitor Status on Power Interruption

When there is a power failure or sudden power interruption, the monitor status is as follows.

- When a battery pack is installed in the monitor, the BSM-6301 and BSM-6501 bedside monitors operate for about 90 minutes and the BSM-6701 bedside monitor operates for about 60 minutes on battery power.
- When the monitor has no battery pack installed or the battery pack is discharged, the monitor turns off. The patient data and settings are stored for about 30 minutes after power off.

When there is a power failure or sudden power interruption, immediately connect the monitor to the emergency power source. It is recommended to always keep the battery pack in the monitor.

Turning the Monitor Off



Press the [Power] switch on the bedside monitor for more than three seconds to turn the power off. The screen becomes dark and the power lamp on the front panel turns off.

NOTE:

- Press the [Power] switch and hold for more than three seconds to turn the power off.
- Do not disconnect the power cord while the monitor power is on. Data may be lost.
- Even though the position of symbol marks for the lamps are different on BSM-6301 and BSM-6501/BSM-6701 bedside monitors, the function and the position of lamps are the same.

The power can also be turned off by pressing the [POWER] button for more than three seconds on the remote control.

Check After or Before Turning the Power Off

Check the following items for the next use.

- Previous patient data is deleted.
- Temporarily changed settings are changed back to the previous settings.
- There is no dirt, damage or scratches on the monitor.
- The sensors, probes, transducers, and cables are cleaned and sterilized.
- Accessories are cleaned and stored properly.
- There are enough consumables, such as recording paper, and disposable electrodes for the next use.
- Battery pack is fully charged.
- The power switch on the monitor is turned off and the power cord is disconnected from the monitor.
- The monitor is not in a wet place.
- Dead batteries are disposed of properly.
- The medical waste is disposed of properly.
- The monitor is stored properly.

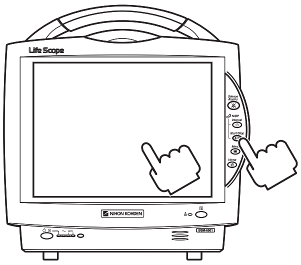
Basic Operation

The monitor can be operated by the following methods. These methods can be used together.

- The hard keys on the bedside monitor
- Touch screen
- Remote control
- Mouse

This manual mainly describes operations using the hard keys on the bedside monitor and touch screen.

Using the Hard Keys on the Bedside Monitor and Touch Screen

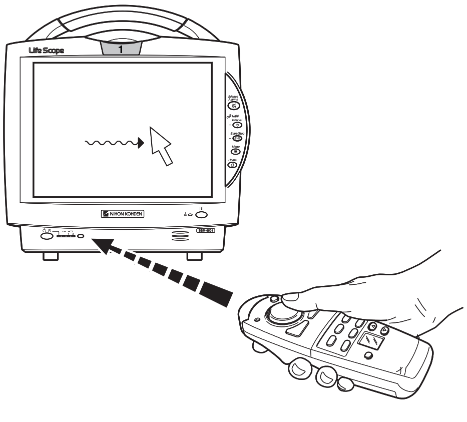


Press the key on the bedside monitor to open the window or operate the function assigned to the key.

Press the key on the screen to select the setting or open/close a window. You can use the scroll bar on the screen to scroll data on the window.

There is a pip sound when a key or screen is touched, or the scroll bar on the screen is used.

Using the Remote Control



Use the remote control to operate the monitor from a distance. A pointer appears on the screen when the monitor is operated by the remote control. The remote control channel can be assigned to the monitor to prevent operating a different monitor. Point the transmitter on the remote control to the remote control sensor on the bedside monitor.

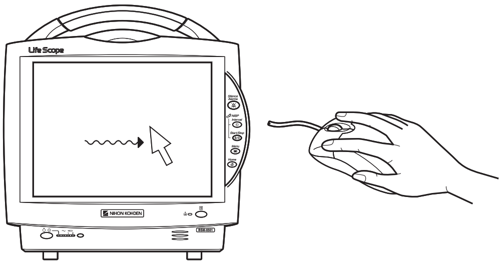
Press the keys on the remote control to open/close a window.
Move the selection knob up/down/left/right to scroll the data or select a setting and press the [ENTER] key to register the setting.

There is a pip sound when a key on the remote control is pressed or the selection knob is moved to scroll the data.

NOTE:

- Watch the monitor screen and check the operation when using the remote control to avoid wrong operation.
- Make sure that the remote control is handled appropriately.

Using the Mouse



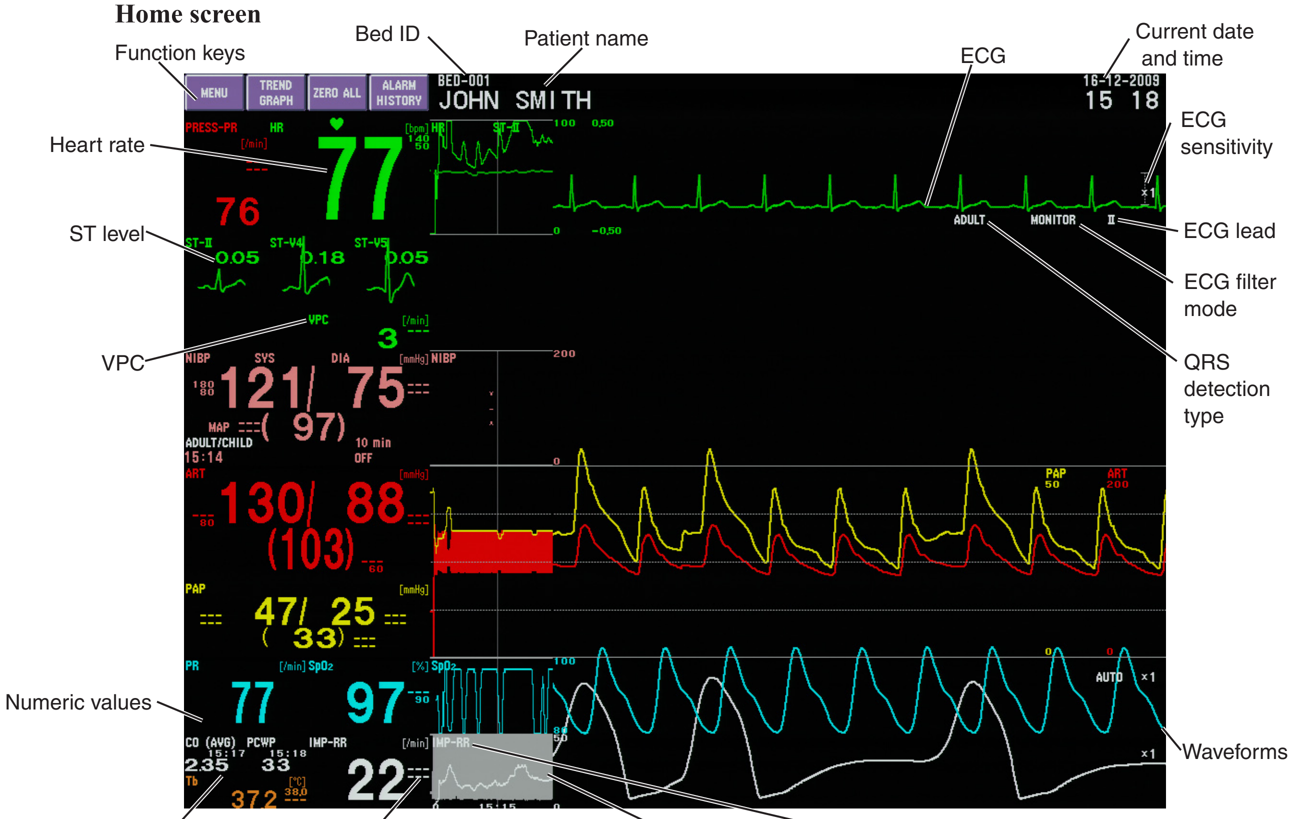
When connecting a QI-632P, QI-634P or QI-672P interface, use the mouse to move the pointer on the screen and click the left button to select and register the setting.

There is a pip sound when the mouse is clicked.

Home Screen Description

The home screen displays the numeric values and waveforms of the monitoring parameters, current trendgraphs, various messages and operation keys. Different screen layouts are available by changing the settings on the SYSTEM SETUP window.

Home screen


Function keys
Bed ID
Patient name
ECG
Current date and time
ECG sensitivity
Heart rate
ST level
ECG lead
ECG filter mode
QRS detection type
VPC
Numeric values
Waveforms
MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
16-12-2009
15 18
PRESS-PR
HR
77
76
ST-II 0.05
ST-V4 0.18
ST-V5 0.05
VPC 3
NIBP
SYS
DIA
121/ 75
MAP (97)
ADULT/CHILD
15:14
10 min OFF
ART
130/ 88
(103)
PAP
47/ 25
(33)
PR
77
SpO2
97
CO (AVG) 2.35
PCWP 33
IMP-RR 22
Tb 37.2
ADULT
MONITOR
II
AUTO
×1

Current average CO and PCWP values and the measured time are displayed on the home screen. The data dims after 15 minutes and disappears from the home screen after 24 hours. When data is added to the hemodynamics trend table in the HEMO page of the TREND window, the data disappears from the home screen.

Alarm limit settings
For BSM-6000A series, when the limit is set to OFF, “OFF” is displayed. For BSM-6000K series, when the limit is set to OFF, “---” is displayed.

Current trendgraphs
The width of the trendgraph can be changed. OCRG or PWTT can be displayed instead of trendgraphs.

Respiration rate
Respiration rate is detected from only one parameter. When several respiration parameters are monitored at the same time, the respiration rate is counted from the parameter in the following priority.
Anesthetic gas > Flow > CO_2 > thermistor respiration > impedance respiration

To close the opened window and return to the home screen, press the [Home] key on the bedside monitor or the [MENU/HOME] key on the remote control.

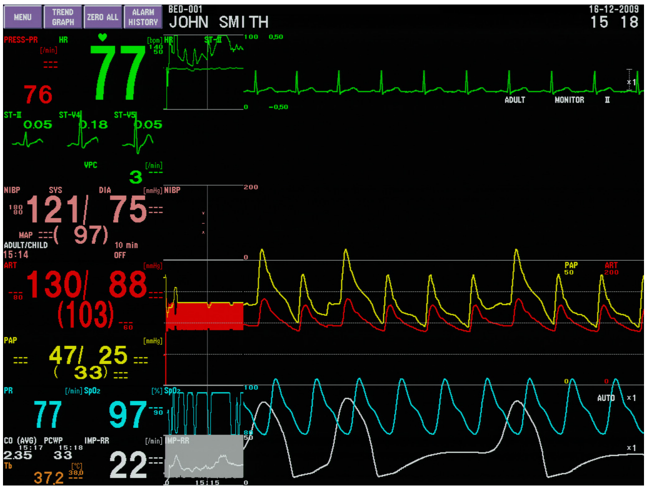
Touching the following items on the home screen displays the following windows.

- Numeric value: Parameter window
- Patient name: ADMIT window
- Time: DATE window
- Function key: Window assigned to the function key

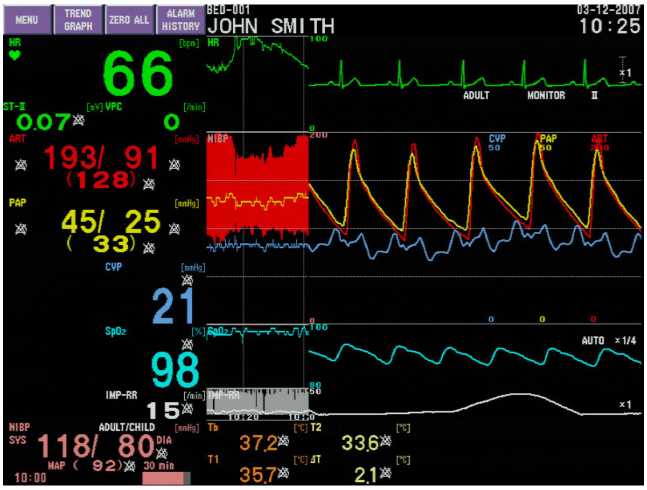
Settings for the Home Screen

The home screen has the following settings.

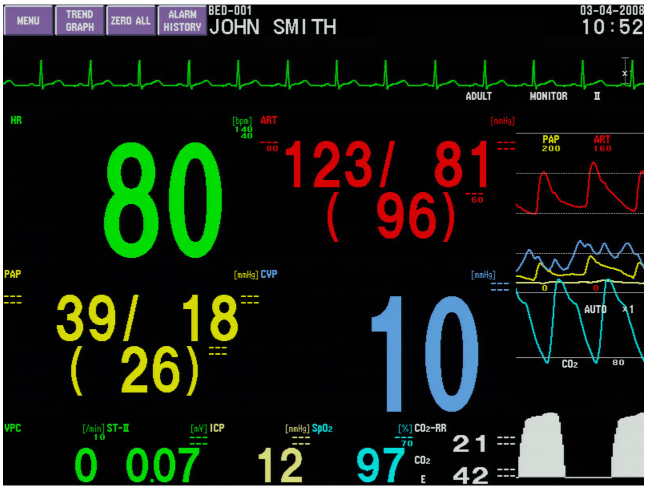
- Select numeric parameter display area (On the DISPLAY window of the SYSTEM SETUP window)
- Select large numeric screen layout (On the DISPLAY window of the SYSTEM SETUP window)


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
16-12-2009
15 18
PRESS-PR
HR
76
77
ST-II
ST-V4
ST-V5
0.05
0.18
0.05
VPC
3
NIBP
SYS
DIA
121/ 75
MAP
(97)
ADULT/CHILD
10 min
OFF
ART
130/ 88
(103)
PAP
47/ 25
(33)
PR
SpO2
77
97
CO (AVG)
PCWP
IMP-RR
235
33
22
Tb
37.2
ADULT
MONITOR
II
PAP
ART
AUTO
x1

NUMERIC PARAMETER AREA - LEFT SIDE


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
03-12-2007
10:25
HR
66
ST-II
VPC
0.07
0
ART
193/ 91
(128)
PAP
45/ 25
(33)
CVP
21
SpO2
98
IMP-RR
15
NIBP
SYS
118/ 80
ADULT/CHILD
DIA
MAP
(92)
30 min
10:00
Tb
37.2
T2
33.6
T1
35.7
ΔT
2.1
ADULT
MONITOR
II
CVP
PAP
ART
AUTO
x1/4
x1

NUMERIC PARAMETER AREA - SIDE + SMALL BOTTOM


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
03-04-2008
10:52
ADULT
MONITOR
II
HR
80
ART
123/ 81
(96)
PAP
ART
PAP
39/ 18
(26)
CVP
10
AUTO
x1
CO2
VPC
ST-II
ICP
SpO2
CO2-RR
0
0.07
12
97
21
42

LARGE NUMERIC SCREEN LAYOUT - 2 × 2

- Select current trendgraph/PWTT trendgraph/OCRG display (On the SYSTEM window of the SYSTEM SETUP window)
- Select PRESS waveform display type (On the DISPLAY window of the SETUP window)
- Select number of ECG waveforms (On the DISPLAY window of the SETUP window)
- Select respiration/CO_2 waveform sweep speed (On the DISPLAY window of the SETUP window)
- Select waveform display on or off (On the DISPLAY window of the SETUP window)
- Select pulse rate display (On the ECG window of the SETUP window)
- Select pulse rate display in SpO_2 or SpO_2-2 area (On the SpO_2 window)
- Select sensitivity/scale of the waveform (Parameter windows) and SCALE SETUP window of the TREND GRAPH window
- Select ST wave and reference ST wave display on or off (On the ST window of the REVIEW window)
- Select PPV/SPV display (On the PRESS window)
- Select the pacing mark position on the ECG waveform (On the PARAMETERS window of the SYSTEM SETUP window)

Trendgraph on the Home Screen (Current Trendgraph)

The latest 30 minute parameter data can be displayed as a trendgraph on the home screen. This trendgraph can be dragged left or right by touching the right edge of the trendgraph on the screen.

OCRG

The OCRG (oxygen-cardio-respirogram) can be displayed on the home screen instead of a trendgraph. To display OCRG on the home screen, select either “OCRG 1 cm/min” or “OCRG 3 cm/min” for <CURRENT TREND> on the DISPLAY window of the SYSTEM SETUP window.

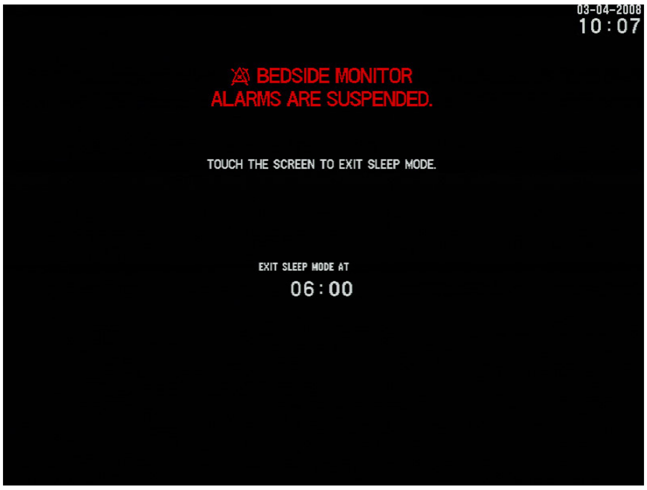
Freezing Waveforms

You can freeze (stop sweeping) the waveforms on the home screen by touching the FREEZE function key at the upper left corner of the screen or on the remote control. The waveforms are frozen for 3 minutes or until they are unfrozen by touching the FREEZE function key again.

Using Sleep Mode

To prevent the monitor from disturbing the patient during sleep or other times, use the SLEEP MODE. In sleep mode, the screen is darkened and sync sound is turned off. To turn sleep mode on, touch the SLEEP key on the MENU window. The sleep mode is only available when the ZS-900P* transmitter is connected or the bedside monitor is connected to the central monitor network.

* ZS-900P transmitter is not available for BSM-6000A series.



03-04-2008
10:07

BEDSIDE MONITOR
ALARMS ARE SUSPENDED.

TOUCH THE SCREEN TO EXIT SLEEP MODE.

EXIT SLEEP MODE AT
06:00

WARNING

When using sleep function, monitor the patient on the central monitor or telemetry system. Otherwise, the bedside monitor alarm may be overlooked. When <EXIT SLEEP MODE ON CRISIS ALARM> check box on the ALARM page of the SYSTEM SETUP window is OFF, bedside monitor alarms and sync sound appear on the central monitor but do not appear on the bedside monitor during sleep mode.

To turn the sleep mode off, touch the screen or press any hard key on the bedside monitor. When the sleep mode is turned off by pressing a hard key, the function of that hard key is also performed.

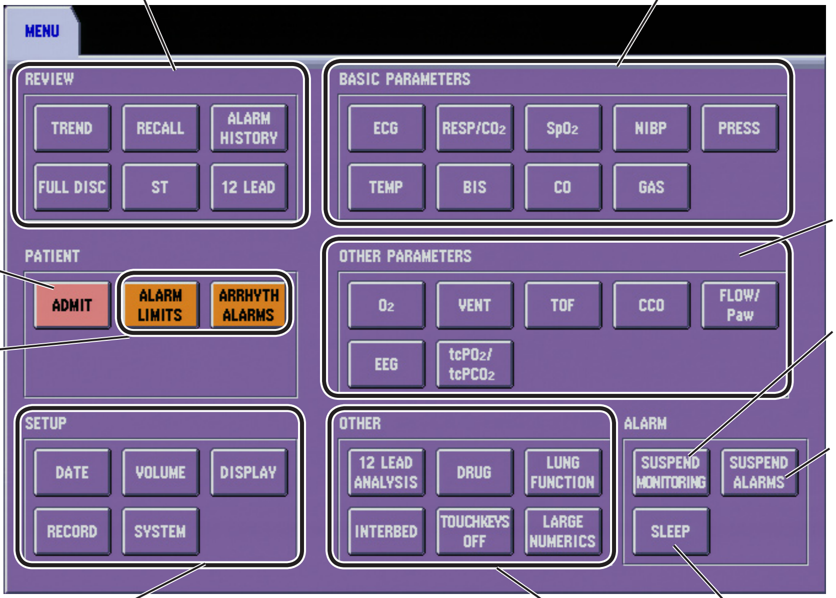
When <EXIT SLEEP MODE ON CRISIS ALARM> on the SLEEP page of the SYSTEM SETUP window is set to ON, the sleep mode is turned off when an CRISIS level alarm occurs. When the time is set in <SLEEP MODE WILL END AT> box, the monitor exits the sleep mode on the set clock time.

When the communication between the bedside monitor and central monitor is interrupted, the bedside monitor exits sleep mode.

MENU Window Description

Press the [Menu] key on the bedside monitor or the [MENU/HOME] key on the remote control to display the MENU window. Any window, except for the home screen and SYSTEM CONFIGURATION screen, can be displayed from the MENU window. The MENU window layout differs according to the selected site.

Example: OR or ICU site


MENU
REVIEW
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
BASIC PARAMETERS
ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
PATIENT
ADMIT
ALARM LIMITS
ARRHYTH ALARMS
OTHER PARAMETERS
O2
VENT
TOF
CCO
FLOW/ Paw
EEG
tcPO2/ tcPCO2
SETUP
DATE
VOLUME
DISPLAY
RECORD
SYSTEM
OTHER
12 LEAD ANALYSIS
DRUG
LUNG FUNCTION
INTERBED
TOUCHKEYS OFF
LARGE NUMERICS
ALARM
SUSPEND MONITORING
SUSPEND ALARMS
SLEEP

Opens the review window

Opens the basic parameter window for changing parameter-related settings

Enters patient information and deletes data

Changes alarm settings

Opens the parameter window for changing parameter-related settings

Suspends all alarms indefinitely in ICU/NICU mode (“BYPASS” in OR mode).

Suspends all alarms for the set time (1, 2 or 3 minutes).

Opens the window for changing date and time, sync/alarm sound volume, screen brightness, waves, recording and assigning functions to remote control keys and administrator setting window.

Opens the analysis/calculation window, displays the INTERBED window, touch key function on/off, displays the large numeric screen

Turns sleep mode on (in ICU and NICU mode only)

NOTE:

- FLOW/Paw and EEG are not available for BSM-6000A series.
- When the site setting is NICU, 12 LEAD key in the <REVIEW> box is OCRG and 12 LEAD ANALYSIS key in the <OTHER> box is not available.

For the alarm off key on the MENU window, refer to “Silencing/Suspending Alarms” in this manual.

Changing Settings

Administrator Settings

Some settings can only be changed by the administrator. A password is required to display the window or enter the screen for changing these settings. These settings are:

- Settings on the SYSTEM SETUP window
- Settings on the SYSTEM CONFIGURATION screen

The details for these settings are described in the Administrator's Guide.

WARNING

ST, CO_2, RESPIRATION, $tcPO_2$/$tcPCO_2$ and HEMOGLOBIN settings only affect the individual bedside monitor, not on all monitors connected to the network. The unit settings must be the same on all bedside monitors and central monitors in the network. Otherwise, the different measurement values and alarms will be displayed on different monitors depending on the unit settings on each monitor.

CAUTION

When installing the monitor, change the time zone setting to the same setting as the other bedside monitors and central monitors. If the time zone setting is not the same, the data which was in the input unit before transport is deleted when using the transport function with the input unit.

Changing Parameter Settings and Other Settings

- DATE window for setting date and time
- VOLUME window for setting alarm and sync sound volume
- DISPLAY window for setting number of ECG waveforms, waveform display, IBP waveform display type and waveform sweep speed on the home screen
- RECORD window for setting recording parameters
- SYSTEM window for checking assigned functions to the remote control keys
- Parameter windows for setting various parameter-related settings

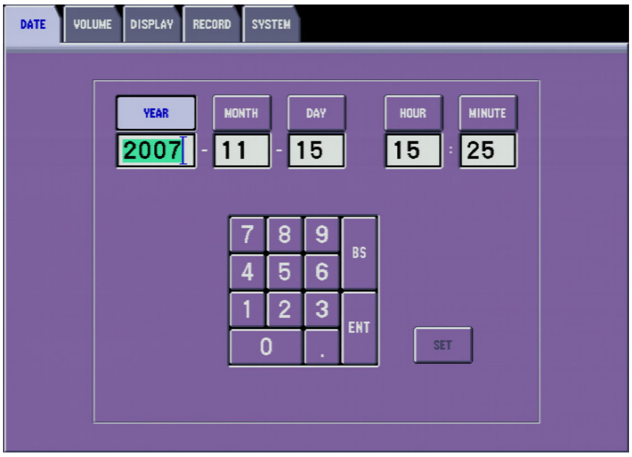
Changing Settings

1. Display the MENU window.

2. Touch the desired menu key on the MENU window to display the setting window.

3. Change the desired item by touching the keys or buttons, or dragging the slider displayed on the setting window.

Example: To correct the date and time


DATE
VOLUME
DISPLAY
RECORD
SYSTEM
7 8 9
4 5 6
1 2 3
0 .
BS
ENT
SET

YEAR 2007 - MONTH 11 - DAY 15 HOUR 15 : MINUTE 25

1. Display the DATE window of the SETUP window.
   Press the [Menu] key → DATE key.

   Or,
   Touch the date and time at the upper right corner on the home screen.

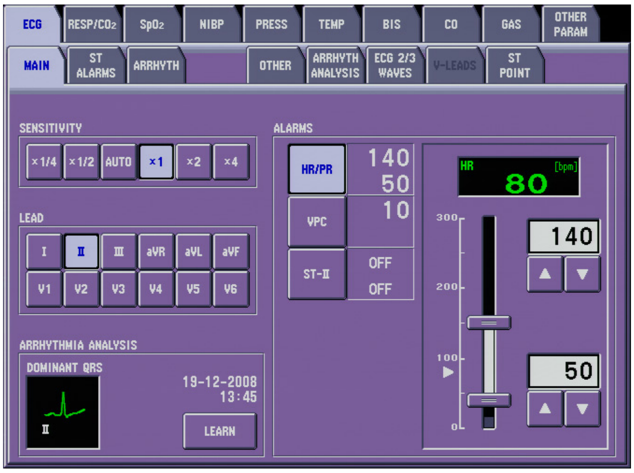
2. Touch the item key to be changed on the DATE window.

3. Touch the desired number key(s).

4. Repeat steps 2 and 3 to change other items.

5. Touch the SET key to enter the setting.

Example: Change the ECG lead


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
SENSITIVITY
×1/4
×1/2
AUTO
×1
×2
×4
LEAD
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
ARRHYTHMIA ANALYSIS
DOMINANT QRS
II
LEARN
ALARMS
HR/PR
VPC
ST-II
HR
[bpm]
80
300
200
100
0
140
50

HR/PR 140 50
VPC 10
ST-II OFF OFF
19-12-2008 13:45

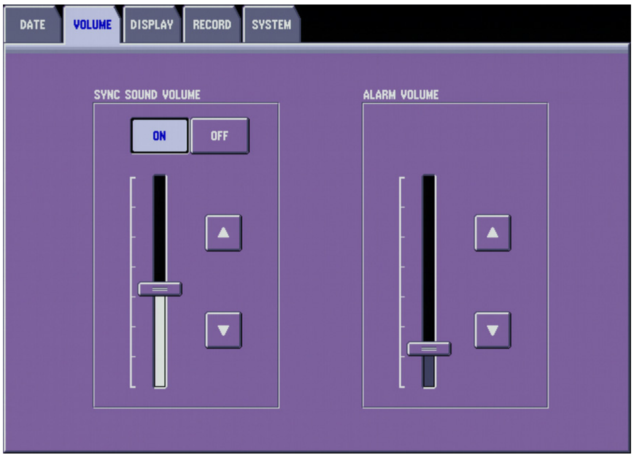
1. Display the MAIN page of the ECG window.
   Press the [Menu] key → ECG key → MAIN tab.

   Or,
   Touch the heart rate value on the home screen.

2. Touch the desired lead key from <LEAD> box.

To change the lead for the second and third traces on the home screen, display the ECG2/3 WAVES page of the ECG window and select the lead for each trace.

Changing Settings on the VOLUME Window


DATE
VOLUME
DISPLAY
RECORD
SYSTEM
SYNC SOUND VOLUME
ON
OFF
ALARM VOLUME
▲
▼
▲
▼

<SYNC SOUND VOLUME>: Set the volume for the sync sound. When ON is selected, there is a beeping sound.

<ALARM VOLUME>: Set the volume for the alarm sound. The alarm volume cannot be turned off.

NOTE: Set the alarm volume depending on the monitoring environment. When you drag the slider or touch the key to the lowest level, the alarm sound goes to the minimum volume.

Admitting a Patient/Discharging a Patient (Deleting Data)

WARNING

Check the alarm settings when admitting a new patient and whenever the patient condition changes and change the alarm settings if necessary. The alarm settings return to the alarm master settings on the SYSTEM SETUP window when:

- All data is deleted on the DELETE page on the ADMIT window.
- <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON and 30 minutes elapse after monitor power off.

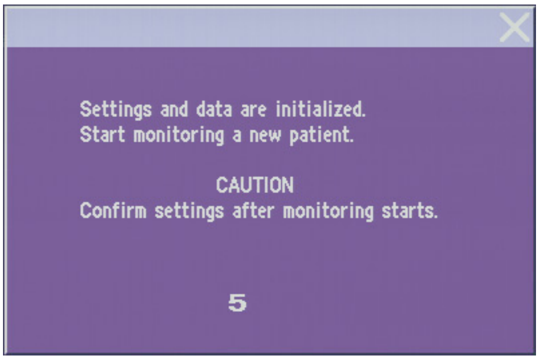
CAUTION

When admitting a new patient, first delete all data of the previous patient. Otherwise, the data of the previous patient and new patient will be mixed together.

When the patient is discharged, the alarm settings, arrhythmia analysis on/off and QRS detection type setting return to the alarm master settings, the NIBP measurement mode returns to the INTERVAL MASTER settings on the SYSTEM SETUP window and the following data are deleted.

- Patient information
- Data on the 12 LEAD ANALYSIS window
- Data on the LUNG FUNCTION window
- Thermodilution curve on the CO window
- Current trendgraph on the home screen
- Data on the review windows
- Data on the DRUG window
- PCWP value on the CO window
- CO table on the MEASURE page of the CO window

You can select whether to automatically delete the previous patient data on the TRANSPORT window of the SYSTEM CONFIGURATION screen. When <AUTO ADMIT> is set to ON, and 30 minutes elapse after turning the power off, the stored data in the monitor is deleted. When the monitor is turned on in less than 30 minutes after turning the power off, the stored data is not deleted and monitoring continues. When <AUTO ADMIT> is set to OFF, the message confirming whether monitoring the new patient appears on the screen after power on.

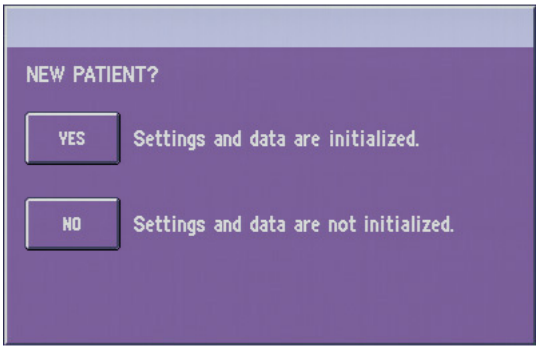


Settings and data are initialized.
Start monitoring a new patient.

CAUTION
Confirm settings after monitoring starts.

5

When AUTO ADMIT is set to ON



NEW PATIENT?

Settings and data are initialized.

Settings and data are not initialized.

When AUTO ADMIT is set to OFF

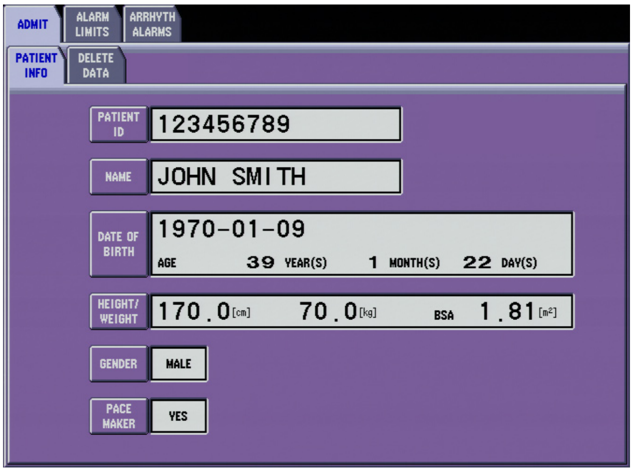
Admitting a Patient

Before entering data for a new patient, you must first delete all data of a previous patient. Refer to the “Discharging a Patient (Deleting Data)” section.

NOTE: After turning the monitor on and when admitting a patient on the monitor, make sure that the time displayed at the upper right of the screen is correct. When the date or time is changed during monitoring, the date and time of all stored data is also changed and might not match the date and time on the printout.

Entering the PATIENT ID, NAME, DATE OF BIRTH or WEIGHT/HEIGHT

Enter the patient information to admit the patient.



PATIENT ID 123456789

NAME JOHN SMITH

DATE OF BIRTH 1970-01-09
AGE 39 YEAR(S) 1 MONTH(S) 22 DAY(S)

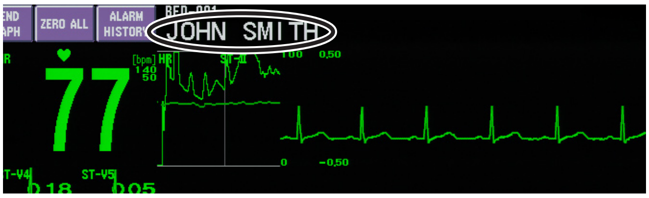
HEIGHT/WEIGHT 170.0 [cm] 70.0 [kg] BSA 1.81 [m²]

GENDER MALE

PACE MAKER YES

1. Display the PATIENT INFO page.
   Press the [Menu] key → ADMIT key.

   Or,
   Touch the patient name area at the upper part of the home screen.



2. Touch the desired key (PATIENT ID, NAME, DATE OF BIRTH or HEIGHT/WEIGHT) on the PATIENT INFO page. The setting window opens.

3. Enter the patient information using the keyboard on the screen and touch the ENT key. For the date of birth, touch the SET key after touching the ENT key.

4. Touch the close key (☒) to close the window. The PATIENT INFO page is displayed.

5. Check the information on the window.

6. Repeat steps 2 to 5 to change other items.

Patient ID can be entered with a bar code reader.

1. Display the PATIENT INFO page.
   Press the [Menu] key → ADMIT key.

   Or,
   Touch the patient name area at the upper part of the home screen.

2. Touch the Patient ID key on the PATIENT INFO page. The PATIENT ID window opens.

NOTE: For BSM-6000A series, patient ID can be entered from the home screen.

3. Scan the bar code of the patient. The PATIENT ID window closes.

4. Confirm that the patient ID is displayed on the PATIENT INFO page.

Entering the GENDER or PACEMAKER USE

1. Display the PATIENT INFO page.
   Press the [Menu] key → ADMIT key.

   Or,
   Touch the patient name area at the upper part of the home screen.

2. Touch the desired key (GENDER or PACE MAKER) on the PATIENT INFO page. The setting window opens.

3. Enter the patient information by touching the key.

4. Touch the close key (☒) to close the window. The PATIENT INFO page is displayed.

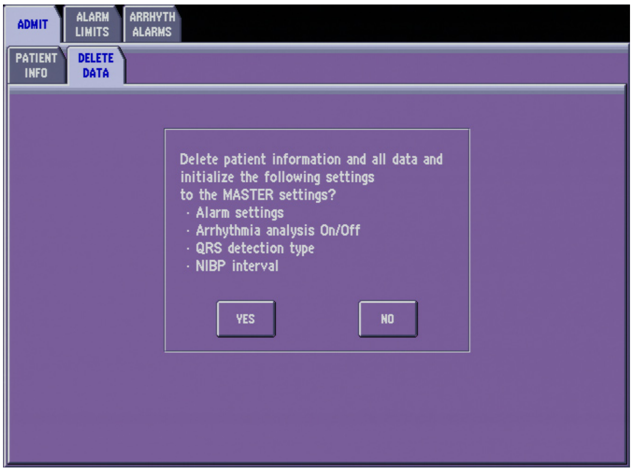
5. Check the information on the window.

6. Repeat steps 2 to 5 to change other items.

Discharging a Patient (Deleting Data)

When monitoring the patient is no longer required, delete the data on the DELETE DATA* page.

* For BSM-6000A series, DELETE DATA tab is NEXT CASE tab when the site setting is OR.



Delete patient information and all data and initialize the following settings to the MASTER settings?
· Alarm settings
· Arrhythmia analysis On/Off
· QRS detection type
· NIBP interval

1. Display the DELETE DATA page of the ADMIT window.
   Press the [Menu] key → ADMIT key → DELETE DATA tab.
   The message confirming the data deletion appears.

2. Touch the YES key to delete the data. Touch the NO key to not delete data.

3. Check the following items to confirm that all data are deleted.
   - Patient name on the home screen is deleted.
   - The message on the DELETE DATA page is dimmed.
   - ALARMS SUSPENDED message appears and alarms are suspended on the monitor.

4. Press the [Home] key to return to the home screen.

Transport

The monitor has a transport function. When an AY-600P series input unit has a QM-600P memory unit installed and <DATA TRANSPORT USING INPUT UNIT> on the TRANSPORT window of the SYSTEM CONFIGURATION screen is set to ENABLE, the data of the bedside monitor can be saved and sent to another bedside monitor.

Patient information and review data can be sent to another bed by disconnecting the input unit from the monitor or JA-690PA or JA-694PA data acquisition unit and connecting it into another monitor or data acquisition unit.

If the original monitor and destination monitors are in the same central monitor network, you can observe the transported patient continuously from the central monitor.

Warnings and Cautions for Transport

General

WARNING

When the input unit is connected to the monitor, make sure to authenticate the patient on the SELECT PATIENT DATA window. Otherwise, monitoring cannot be started.

WARNING

The monitor cannot start monitoring when the input unit is not ready. When the preparation for removing the input unit is complete, immediately insert the input unit into the destination monitor.

CAUTION

If the patient data in the input unit has different measuring units from the data in the main unit, an INPUT UNIT ERROR dialog box to delete the data in the input unit appears. If you do not want to delete the data in the input unit, touch the CANCEL key and remove the input unit from the main unit.

CAUTION

When installing the monitor, change the time zone setting to the same setting as the other bedside monitors and central monitors. If the time zone setting is not the same, the data which was in the input unit before transport is deleted when using the transport function with the input unit.

WARNING

Check the patient information and data range on the SELECT PATIENT DATA window. Otherwise, the patient may be incorrectly identified.

WARNING

Check the alarm settings after patient authentication. The alarm settings depend on the <USE SETTINGS IN INPUT UNIT> ON/OFF setting on the TRANSPORT window of the SYSTEM CONFIGURATION screen of the destination monitor.

CAUTION

When removing the input unit from the monitor when the transport function is enabled, perform the removal procedure of the input unit on the REMOVE page of the TRANSPORT DATA window before removing the input unit. Otherwise, the data in the input unit may be lost.

WARNING

When using transport function, patient data may be mixed together or lost in the following cases:

- Transport function and wireless LAN are used at the same time.
- The network cable is connected or disconnected from the bedside monitor or the input unit is removed while the bedside monitor power is off.

WARNING

When you send data from the bedside monitor to the central monitor, use a 10BASE-T or 100BASE-TX switching hub. If you use another type of hub, the network may lose connection and the patient cannot be monitored on the central monitor.

CAUTION

Do not remove the input unit while the data is being sent to the central monitor. The data may be lost.

CAUTION

When the patient is discharged and there is no need to send the patient data to the central monitor, discharge the patient on the central monitor before removing the input unit. When the input unit is unintentionally removed or inserted when not using transport function, data that was sent to the central monitor in the past may be lost.

NOTE:

- A QM-600P memory unit must be installed in the input unit to use the transport function.
- Transport function not using the network is available with BSM-6000 series bedside monitor software version 02-01 or later.
- Transport function using the network is available with BSM-6000 series bedside monitor software version 02-02 or later.
- If the BSM-6000 series bedside monitors have different software version, transport function cannot be used.
- Transport function using a BSM-9101 bedside monitor is available with BSM-6000 series bedside monitor software version 02-03 or later.
- The transport function is available with CNS-9701 central monitor software version 01-77 or later.

Alarms

Warnings for Alarms

WARNING

When an alarm occurs:

- Check the patient first and take necessary measure to ensure patient's safety.
- Remove the cause of the alarm.
- Check the alarm settings on the bedside monitor and change the alarm settings if necessary.

WARNING

If more than one medical equipment is used together in the same facility, make sure all equipments have the same alarm default settings (alarm master). If the medical equipments have different alarm default settings and when initialized, the alarm settings differ with the other equipments and alarm cannot be managed appropriately in the facility. If using different alarm default settings according to areas or wings in the facility, manage the alarms appropriately.

WARNING

Do not diagnose a patient based on only the alarm information of the bedside monitor. An alarm may not be indicated due to alarm level or alarm on/off setting and critical changes on the patient may be overlooked.

WARNING

A physician must be within the range where he/she can hear the alarm sound of the bedside monitor while monitoring a patient on the bedside monitor. If the physician cannot hear the alarm sound, critical changes on the patient may be overlooked.

Alarm Types and Levels

There are four types of alarms: vital signs, arrhythmias, technical and interbed alarms, and three alarm levels: crisis, warning and advisory.

The monitor can indicate alarms both visually and audibly:

- Alarm sound
- Alarm message or highlighted numeric data on the screen
- Alarm indicator: the alarm indicator indicates three alarm levels.
  CRISIS: Red blinking, WARNING: Yellow blinking, ADVISORY: Cyan or yellow lit

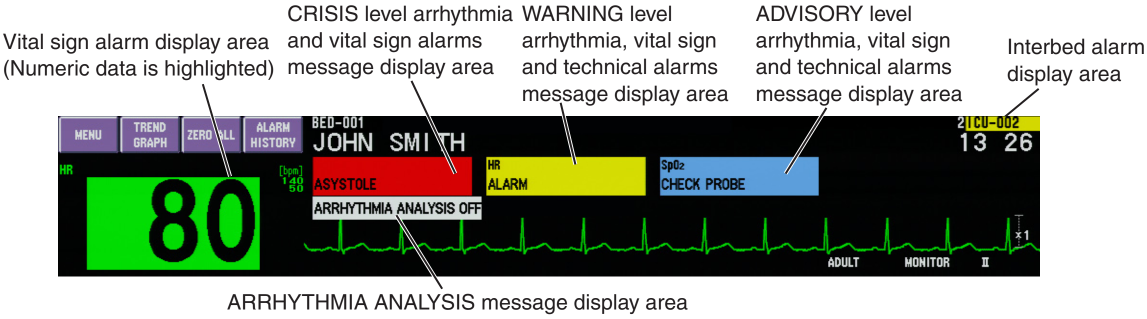
Alarm level	Alarm sound	Alarm display on the screen		Alarm indicator LED	Alarm recording
		Message	Numeric data		
CRISIS	NK1 (Continuous pip sound), NK2 (Continuous ping sound) or IEC standard (ceg-gC)	Highlighted red message	When ALARM* is selected: Highlighted red numeric data When PARAMETER is selected: Highlighted parameter color numeric data	Blinking red	Recorded at alarm occurrence when alarm recording on the RECORD window is set to ON.
WARNING	NK1 (Continuous bing bong sound), NK2 (Continuous ding ding sound) or IEC standard (ceg)	Highlighted yellow or orange message	When ALARM* is selected: Highlighted yellow or orange numeric data When PARAMETER is selected: Highlighted parameter color numeric data	Blinking yellow	
ADVISORY	NK1 and NK2 (Single beep every 20 or 120 seconds) or IEC standard (ec)	Highlighted cyan or yellow message	When ALARM* is selected: Highlighted cyan or yellow numeric data When PARAMETER* is selected: Highlighted parameter color numeric data	Lights in cyan or yellow	

When an arrhythmia alarm is generated, even if the patient recovers quickly from the arrhythmia, the alarm status continues for a short time. The time depends on the alarm level.

- CRISIS: 30 s
- WARNING: 20 s
- ADVISORY: 10 s

The alarm sound, alarm display color and alarm indicator color are selected on the ALARM window of the SYSTEM SETUP window.

* The numeric data display color depends on PARAMETER or ALARM setting in <DISPLAY COLOR MODE> on the GENERAL page of the SYSTEM SETUP window.


Vital sign alarm display area (Numeric data is highlighted)
CRISIS level arrhythmia and vital sign alarms message display area
WARNING level arrhythmia, vital sign and technical alarms message display area
ADVISORY level arrhythmia, vital sign and technical alarms message display area
Interbed alarm display area
MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
2 ICU-002
13 26
HR
80
[bpm] 140 50
ASYSTOLE
ARRHYTHMIA ANALYSIS OFF
HR ALARM
SpO2 CHECK PROBE
x1
ADULT
MONITOR
II
ARRHYTHMIA ANALYSIS message display area

ARRHYTHMIA ANALYSIS message is not highlighted when the site is NICU.

When two or more alarms of the same level occur at the same time, the messages are displayed alternately.

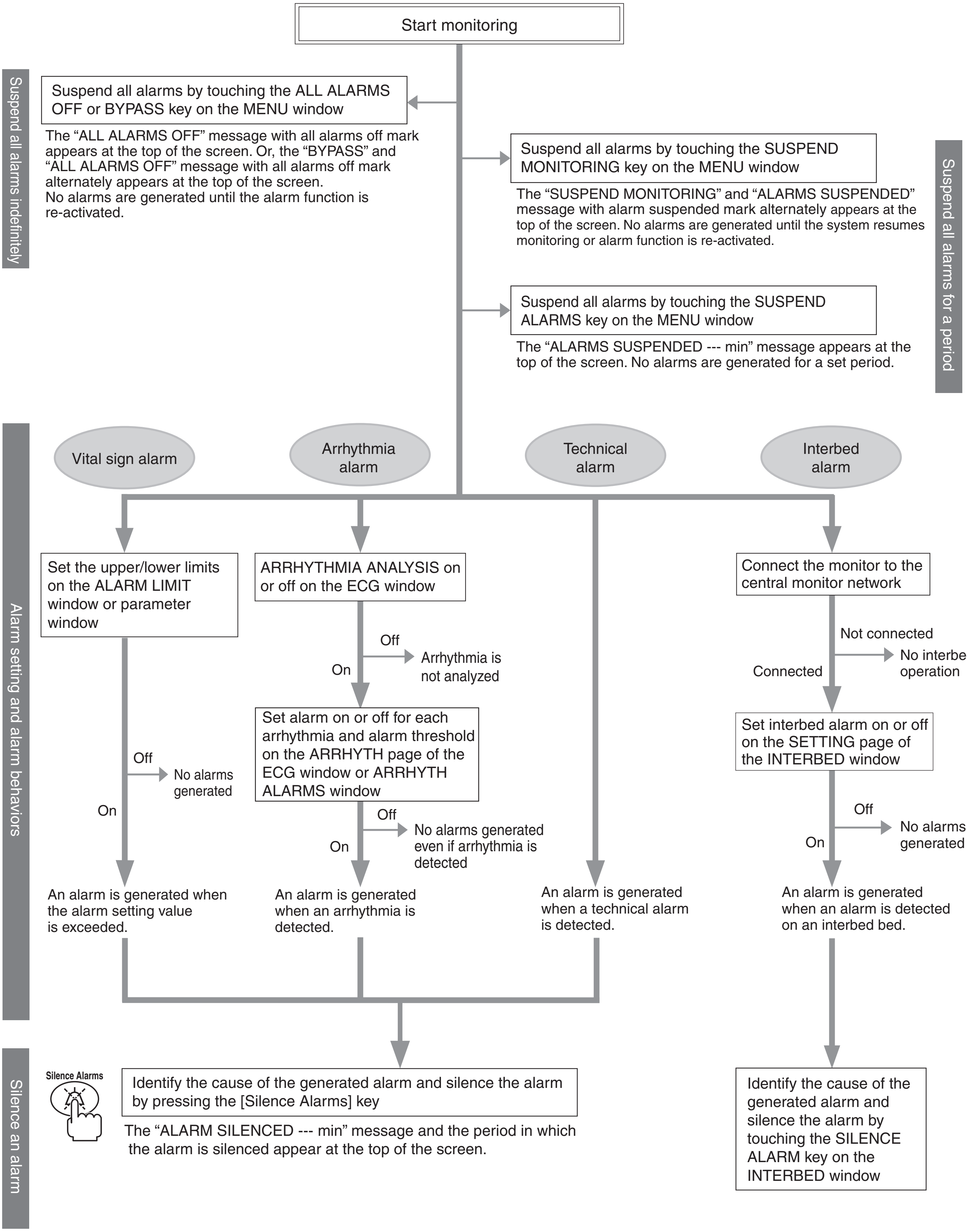
Alarm Control Marks

Alarm is silenced by pressing the [Silence Alarms] key on the bedside monitor or [SILENCE ALARMS] key on the remote control. Remaining minutes appears.

Alarms are suspended for a certain period.

Alarms are suspended infinitely or vital sign alarm limit is set to off.

Flow of Alarm Function


Start monitoring

Suspend all alarms by touching the ALL ALARMS OFF or BYPASS key on the MENU window

The “ALL ALARMS OFF” message with all alarms off mark appears at the top of the screen. Or, the “BYPASS” and “ALL ALARMS OFF” message with all alarms off mark alternately appears at the top of the screen. No alarms are generated until the alarm function is re-activated.

Suspend all alarms by touching the SUSPEND MONITORING key on the MENU window

The “SUSPEND MONITORING” and “ALARMS SUSPENDED” message with alarm suspended mark alternately appears at the top of the screen. No alarms are generated until the system resumes monitoring or alarm function is re-activated.

Suspend all alarms by touching the SUSPEND ALARMS key on the MENU window

The “ALARMS SUSPENDED --- min” message appears at the top of the screen. No alarms are generated for a set period.

Set the upper/lower limits on the ALARM LIMIT window or parameter window

An alarm is generated when the alarm setting value is exceeded.

ARRHYTHMIA ANALYSIS on or off on the ECG window

Set alarm on or off for each arrhythmia and alarm threshold on the ARRHYTH page of the ECG window or ARRHYTH ALARMS window

An alarm is generated when an arrhythmia is detected.

An alarm is generated when a technical alarm is detected.

Connect the monitor to the central monitor network

Set interbed alarm on or off on the SETTING page of the INTERBED window

An alarm is generated when an alarm is detected on an interbed bed.

Identify the cause of the generated alarm and silence the alarm by pressing the [Silence Alarms] key

The “ALARM SILENCED --- min” message and the period in which the alarm is silenced appear at the top of the screen.

Identify the cause of the generated alarm and silence the alarm by touching the SILENCE ALARM key on the INTERBED window

Suspend all alarms indefinitely
Suspend all alarms for a period
Alarm setting and alarm behaviors
Silence an alarm
Vital sign alarm
Arrhythmia alarm
Technical alarm
Interbed alarm
Off
On
No alarms generated
Off
On
Arrhythmia is not analyzed
Off
On
No alarms generated even if arrhythmia is detected
Not connected
Connected
No interbed operation
Off
On
No alarms generated
Silence Alarms

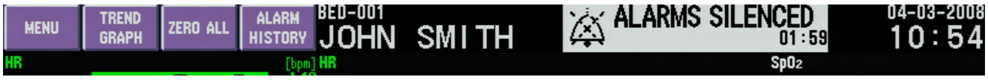
Silencing/Suspending Alarms

Silencing Alarms

When an alarm occurs, you can silence the alarm sound and indications for one, two or three minutes by pressing the [Silence Alarms] key on the bedside monitor or remote control. When a vital signs alarm other than NIBP or arrhythmia alarm is silenced, the alarm resumes after the alarm silence ends. When a technical alarm other than the following alarms is silenced, the alarm indication does not resume after the alarm silence ends. If the following alarms are silenced, the alarm resumes after the alarm silence ends.

- BATTERY ERROR
- CO_2 CHANGE ABSORBENT
- ECG CANNOT ANALYZE
- GAS LINE BLOCK
- MULTILINK CONFIG ERROR
- NIBP CUFF OCCLUSION
- SpO_2 CHANGE PROBE
- BATTERY WEAK
- CO_2 LINE BLOCK
- EXTERNAL DEVICE ALARM
- GAS MIXED GAS
- MULTILINK POWER ERROR
- NIBP SAFETY CIRCUIT RUNNING

When several alarms occur together and the [Silence Alarms] key is pressed, all alarms are silenced. To cancel vital sign or arrhythmia alarm silence, press the [Silence Alarms] key. <SILENCE ALARMS TIME> is set on the ALARM window of the SYSTEM SETUP window.


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
ALARMS SILENCED
01:59
04-03-2008
10:54
HR
[bpm]
HR
SpO2

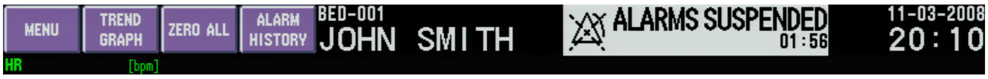
When the Monitor is Connected to the Central Monitor Network

When the bedside monitor is connected to a central monitor network, all alarms other than NIBP alarm are temporarily silenced by touching the Silence Alarms key on the central monitor. Refer to the central monitor operator's manual for details.

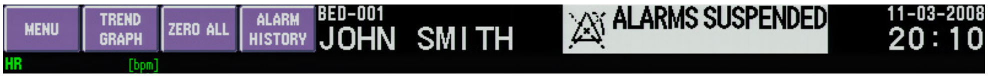
Suspending Alarms

All alarms can be suspended before they occur. This monitor has three types of alarm suspension:

- Suspending all alarms for one, two or three minutes by touching the SUSPEND ALARMS key. For example: for electrode replacement, etc.
  Alarm function resumes when the suspend alarm time elapses or the SUSPEND ALARMS key is touched. <SUSPEND ALARMS TIME> is set on the ALARM window of the SYSTEM SETUP window.
  * SUSPEND ALARMS key is available when SUSPEND ALARMS is selected for <ALARM INACTIVATION> on the ALARM window of the SYSTEM SETUP window.


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
ALARMS SUSPENDED
01:56
11-03-2008
20:10
HR
[bpm]

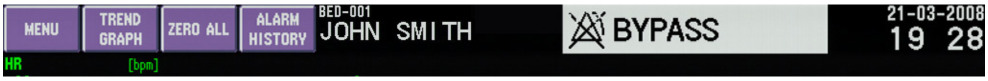
When admitting or discharging a patient or when the monitor power is turned on, alarms are automatically suspended. Alarm function resumes when the monitoring conditions*[1] are continuously met or the SUSPEND ALARMS key is touched.

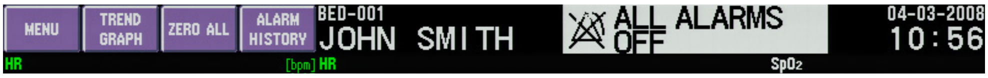

MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
ALARMS SUSPENDED
11-03-2008
20:10
HR
[bpm]

- Suspending all alarms indefinitely by touching the BYPASS key (in OR mode only) or ALL ALARMS OFF key*[2] on the MENU window. For example: suspend alarms when the patient is connected to a heart-lung machine.

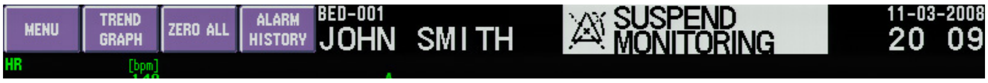
When the <ALARM INDICATOR LIT> on the ALARM window of the SYSTEM SETUP window is set to ON, the red lamp of the alarm indicator lights when all alarms are indefinitely suspended with the BYPASS or ALL ALARMS OFF key.

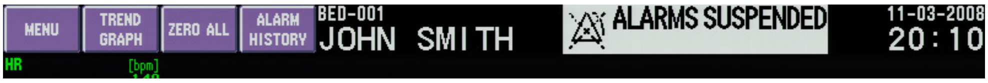
Alarm function resumes when the BYPASS or ALL ALARMS OFF key is touched.


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
BYPASS
21-03-2008
19 28
HR
[bpm]


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
ALL ALARMS OFF
04-03-2008
10:56
HR
[bpm] HR
SpO2

- Suspending all alarms indefinitely by touching the SUSPEND MONITORING key*[3]. For example: suspend alarms while the patient is being examined. The "SUSPEND MONITORING" and "ALARMS SUSPENDED" messages appear on the screen alternately.


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
SUSPEND MONITORING
11-03-2008
20 09
HR
[bpm]


MENU
TREND GRAPH
ZERO ALL
ALARM HISTORY
BED-001
JOHN SMITH
ALARMS SUSPENDED
11-03-2008
20:10
HR
[bpm]

Alarm function resumes when the SUSPEND MONITORING key or SUSPEND ALARMS key is touched or the following monitoring conditions*[1] are continuously met.

*1

Setting of <ALARM ACTIVATION DELAY> on the SYSTEM SETUP window	Condition
AUTO	Alarm function activates when ECG, SpO_2 or IBP* is monitored or NIBP** is measured and a value is displayed. * When SYS > DIA, the difference between these two values is 3 mmHg and this status continues for more than 3 seconds. ** When SYS, DIA or MAP value is measured. The alarm function is also recovered when the heart rate is 0.
1 min 2 min 3 min	When one of the following requirements is met. 1 ECG, SpO_2 or IBP is continuously monitored for the selected time. 2 NIBP is measured (SYS, DIA or MAP value is measured) 3 Heart rate becomes 0.

*[2] The ALL ALARMS OFF key is available when ALL ALARMS OFF is selected for <ALARM INACTIVATION> on the ALARM window of the SYSTEM SETUP window.

*[3] SUSPEND MONITORING key is available when SUSPEND ALARMS is selected for <ALARM INACTIVATION> on the ALARM window of the SYSTEM SETUP window.

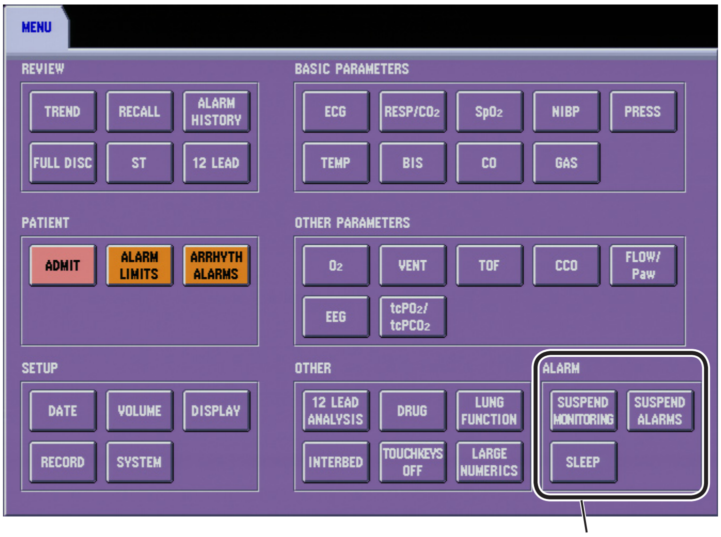
WARNING

During alarm suspension ("ALARMS SUSPENDED" or "ALL ALARMS OFF" message displayed), all alarms are turned off. Be careful when you suspend the alarm.

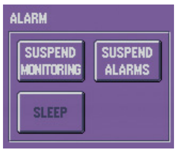
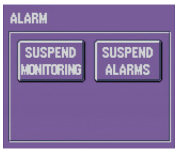
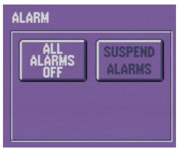
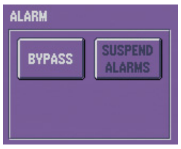
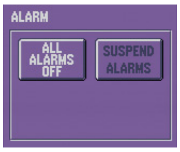
WARNING

Do not turn all alarms off with the ALL ALARMS OFF or BYPASS key when there is no medical staff around the patient or when the patient is connected to a ventilator.

The alarm off key on the MENU window


MENU
REVIEW
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
BASIC PARAMETERS
ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
PATIENT
ADMIT
ALARM LIMITS
ARRHYTH ALARMS
OTHER PARAMETERS
O2
VENT
TOF
CCO
FLOW/ Paw
EEG
tcPO2/ tcPCO2
SETUP
DATE
VOLUME
DISPLAY
RECORD
SYSTEM
OTHER
12 LEAD ANALYSIS
DRUG
LUNG FUNCTION
INTERBED
TOUCHKEYS OFF
LARGE NUMERICS
ALARM
SUSPEND MONITORING
SUSPEND ALARMS
SLEEP

Alarm off keys

ALARM INACTIVATION setting	ICU/NICU site	OR site
SUSPEND ALARMS		
ALL ALARMS OFF		ALARMS OFF TYPE: BYPASS  ALARMS OFF TYPE: ALL ALARMS OFF 

Alarm off function

SUSPEND MONITORING key

Use this key to temporarily stop patient monitoring for examination. When this key is touched, all alarms and NIBP STAT/SIM and auto measurements are suspended. Alarms resume when the SUSPEND MONITORING key is touched again or when the <ALARM ACTIVATION DELAY> condition is met.

SUSPEND ALARMS key

Use this key to suspend all alarms for the time set in <SUSPEND ALARMS TIME>.

BYPASS key

Use this key when the patient is connected to a heart-lung machine. When this key is touched, all alarms and NIBP STAT/SIM and auto measurements are indefinitely suspended. Touch the BYPASS key and touch the YES key on the confirmation window. Alarms resume when the BYPASS key is touched again.

ALL ALARMS OFF key

Use this key to suspend all alarms indefinitely. Touch the ALL ALARMS OFF key and touch the YES key on the confirmation window. Alarms resume when the ALL ALARMS OFF key is touched again.

Canceling Technical Alarms

When you remove a sensor cable, probe cable or input unit from the bedside monitor and press the [Silence Alarms] key, the technical alarm can be canceled. Touching the SUSPEND MONITORING, SUSPEND ALARMS, BYPASS and ALL ALARMS OFF keys also cancel the technical alarm.

Alarm Sound Volume

The alarm sound volume is adjusted on the VOLUME window in the SETUP window.

Alarm Recording

With an optional WS-671P recorder module, you can set the monitor to automatically record ECG waveforms and data when an alarm occurs. Set <ALARM RECORDING> on the OTHER page of the RECORD window in the SETUP window to ON. The waveforms of 8 seconds before to 12 seconds after the alarm occurrence are recorded.

Alarm Setting

There are vital sign upper/lower limit alarm and arrhythmia alarm settings. The vital sign alarm settings can be set on the ALARM LIMITS window. The arrhythmia alarm settings can be set on the ARRHYTH ALARMS window. The vital sign alarm setting can also be changed on the setting window for each parameter and the arrhythmia alarm setting can also be changed on the ARRHYTH window of the ECG window. The alarm settings are linked between different windows. For example, when a heart rate upper alarm limit is changed on the ALARM LIMITS window, the heart rate upper alarm limit is also changed on the ECG window. This section describes changing settings on the ALARM LIMITS and ARRHYTH ALARM windows.

The alarm settings return to the alarm master settings when a patient is discharged, or when <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON, the alarm settings return to the default settings 30 minutes after the monitor is turned off. When <AUTO ADMIT> is set to OFF, you can select whether to save the settings or initialize the master settings.

WARNING

Check the alarm settings when admitting a new patient and whenever the patient condition changes and change the alarm settings if necessary. The alarm settings return to the alarm master settings on the SYSTEM SETUP window when:

- All data is deleted on the DELETE page on the ADMIT window.
- <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON and 30 minutes elapse after monitor power off.

WARNING

For arrhythmia monitoring, set <ARRHYTHMIA ANALYSIS> on the ECG window to ON. Otherwise, there is no sound or indication for arrhythmia alarms (except for ASYSTOLE).

WARNING

If more than one medical equipment is used together in the same facility, make sure all equipments have the same alarm default settings (alarm master). If the medical equipments have different alarm default settings and when initialized, the alarm settings differ with the other equipments and alarm cannot be managed appropriately in the facility. If using different alarm default settings according to areas or wings in the facility, manage the alarms appropriately.

CAUTION

When the alarm limit is set to OFF, there will be no alarm for that limit. Depending on the setting, the alarm off mark might not be displayed on the screen. Be careful when you set the alarm limit to OFF.

CAUTION

When the alarm is turned OFF for an arrhythmia, there will be no alarm for that arrhythmia type. There is no message or mark to indicate that a certain arrhythmia alarm is turned off. Therefore, be careful when you turn off an arrhythmia alarm.

CAUTION

When the ZS-900P transmitter is attached to the bedside monitor, check the alarm, arrhythmia and monitoring settings on the central monitor or telemetry system. The transmitter does not transmit the alarm, arrhythmia and monitoring setting information.

When the Monitor is Connected to the Central Monitor Network

When the bedside monitor is connected to a central monitor network, the alarm setting can also be changed from the central monitor. When the alarm setting is changed on the central monitor, check that the same setting on the bedside monitor is also changed.

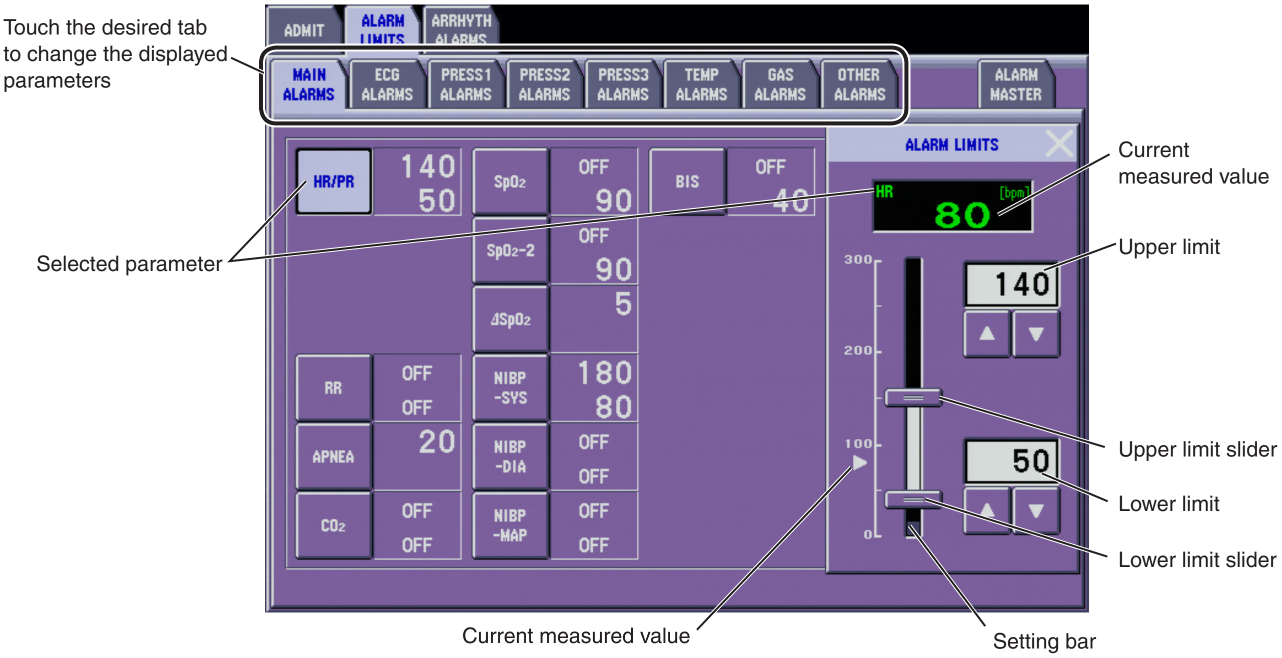
Changing Vital Sign Upper/Lower Alarm Limits

There are three ways to change vital sign upper/lower alarm limits.

- Change upper or lower alarm limits for each parameter individually.
- Change upper or lower alarm limits for each parameter individually from the each parameter window. Refer to the "Monitoring Parameters" section.
- Set all alarm limits to the alarm master settings. The procedure is described in the User's Guide Part I.

Changing Each Parameter Alarm Limits Individually

1. Display the ALARM LIMITS window.
   Press the [Menu] key → ALARM LIMITS key.


Touch the desired tab to change the displayed parameters
ADMIT
ALARM LIMITS
ARRHYTH ALARMS
MAIN ALARMS
ECG ALARMS
PRESS1 ALARMS
PRESS2 ALARMS
PRESS3 ALARMS
TEMP ALARMS
GAS ALARMS
OTHER ALARMS
ALARM MASTER
ALARM LIMITS
HR/PR
140
50
SpO2
OFF
90
BIS
OFF
40
SpO2-2
OFF
90
ΔSpO2
5
RR
OFF
OFF
NIBP -SYS
180
80
APNEA
20
NIBP -DIA
OFF
OFF
CO2
OFF
OFF
NIBP -MAP
OFF
OFF
HR
[bpm]
80
300
200
100
0
140
▲
▼
50
▲
▼
Current measured value
Upper limit
Upper limit slider
Lower limit
Lower limit slider
Selected parameter
Current measured value
Setting bar

2. Touch the parameter key for the limit you want to change.

3. Touch or drag the sliders to the desired level on the setting bar. Use the ▲ or ▼ key to adjust the setting.

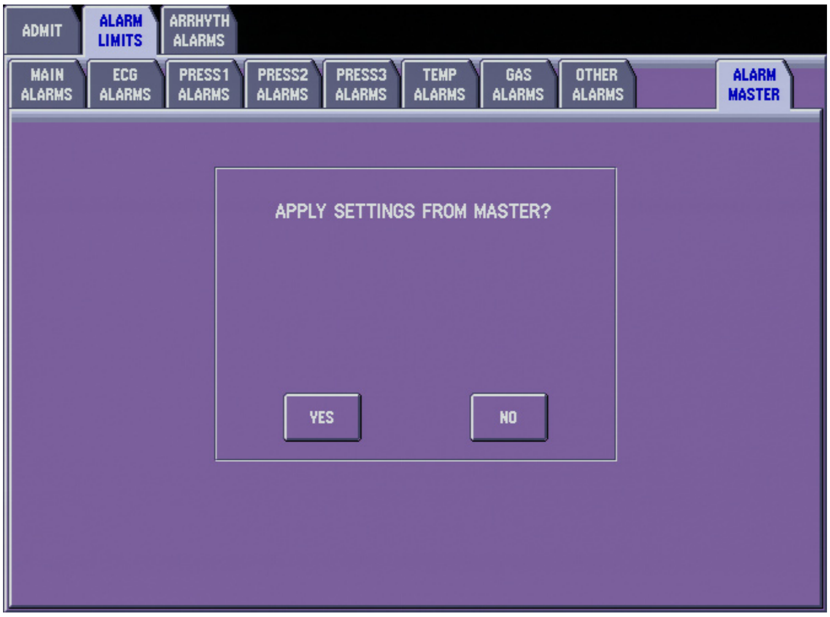
4. Press the [Home] key to return to the home screen.

Changing All Alarm Limits to the Alarm Master Settings

All alarms, including arrhythmia alarm, can be set to a group of alarm settings called the alarm master. The alarm masters are set by the administrator on the MASTER window of the SYSTEM SETUP window.

NOTE: The vital sign upper/lower limits settings and arrhythmia alarm settings are changed on the different alarm master page.

1. Display the ALARM MASTER page. The "APPLY SETTINGS FROM MASTER?" message appears.
   Press the [Menu] key → ALARM LIMITS key → ALARM MASTER tab.



APPLY SETTINGS FROM MASTER?

ADMIT
ALARM LIMITS
ARRHYTH ALARMS
MAIN ALARMS
ECG ALARMS
PRESS1 ALARMS
PRESS2 ALARMS
PRESS3 ALARMS
TEMP ALARMS
GAS ALARMS
OTHER ALARMS
ALARM MASTER
YES
NO

2. Touch the YES key to change all alarm settings to the alarm master settings. Touch the NO key to cancel changing the alarm settings to the alarm master settings.

3. Press the [Home] key to return to the home screen.

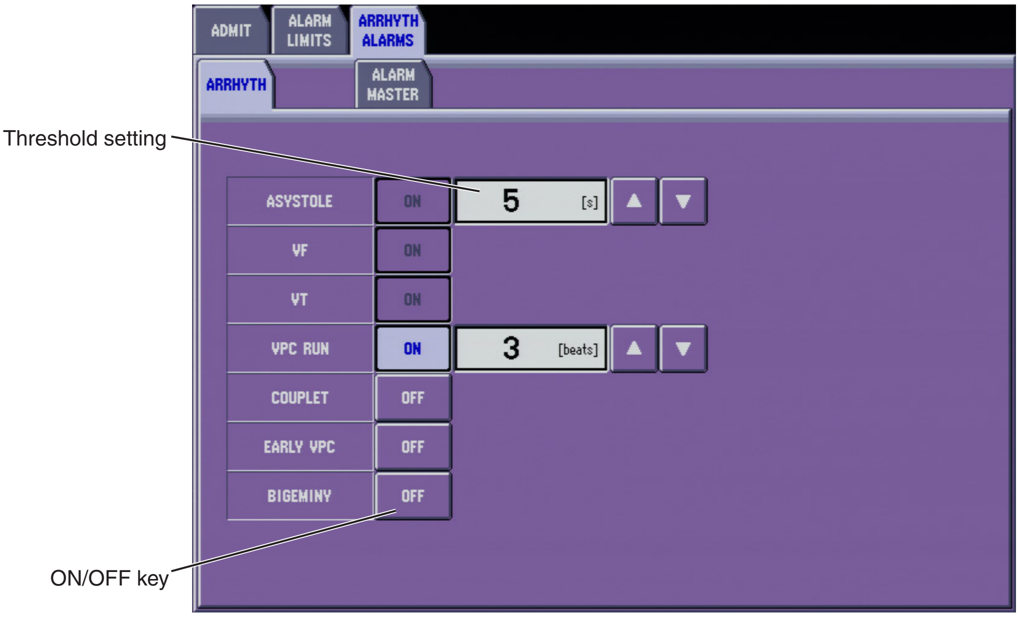
Changing the Arrhythmia Alarm Settings

You can turn the alarm for individual arrhythmias on or off and set the threshold for some arrhythmias.

The arrhythmia alarm can also be set to the alarm master settings. To use the alarm master, refer to the "Changing All Alarm Limits to the Alarm Master Settings" earlier in this section.

NOTE: When "EXTENDED" is selected for arrhythmia type and the bedside monitor is connected to a central monitor network that has old software so that "EXTENDED" arrhythmias cannot be monitored, the "COMMUNICATION LOSS" message appears for the bedside monitor and the bedside monitor cannot be monitored on the central monitor.

1. Display the ARRHYTH page.
   Press the [Menu] key → ARRHYTH ALARMS key → ARRHYTH tab.



Threshold setting

ASYSTOLE ON 5 [s]
VF ON
VT ON
VPC RUN ON 3 [beats]
COUPLET OFF
EARLY VPC OFF
BIGEMINY OFF

ON/OFF key

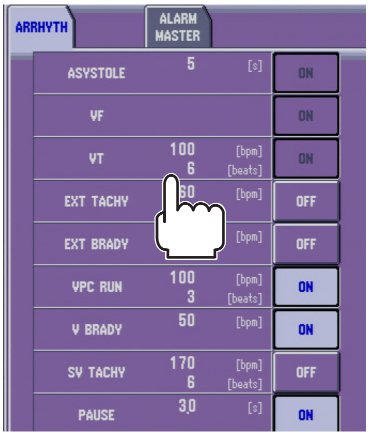
2. To turn off an arrhythmia alarm
   Touch the ON key to turn it to OFF.

   To turn on an arrhythmia alarm
   Touch the OFF key to turn it to ON.

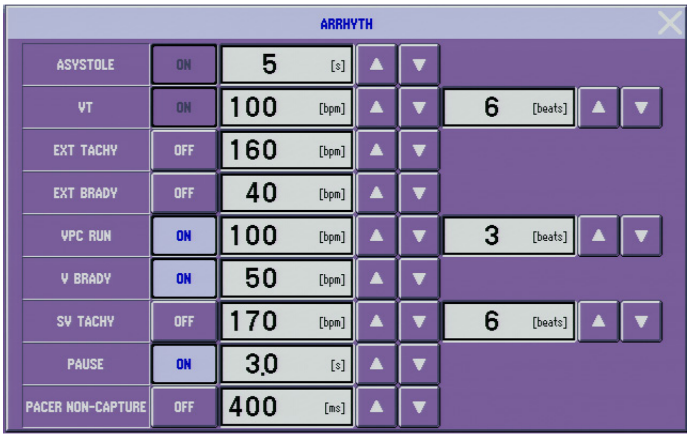
   To set the threshold
   Use the ▲ or ▼ key to adjust the setting.

NOTE:
- For BSM-6000A series, items can be turned on/off but thresholds are fixed and cannot be changed. The thresholds are set by the administrator on the MASTER window of the SYSTEM SETUP window.
- The arrhythmia type setting is not available on the BSM-6000A series. For BSM-6000A series, arrhythmia type is STANDARD only.

When EXTENDED is selected for the <ARRHYTHMIA TYPE> on the ECG page of the PARAMETERS window in the SYSTEM SETUP window, touch the threshold to display the ARRHYTH window and adjust the setting.



ASYSTOLE	5 [s]	ON
VF		ON
VT	100 [bpm] 6 [beats]	ON
EXT TACHY	60 [bpm]	OFF
EXT BRADY	[bpm]	OFF
VPC RUN	100 [bpm] 3 [beats]	ON
V BRADY	50 [bpm]	ON
SV TACHY	170 [bpm] 6 [beats]	OFF
PAUSE	3.0 [s]	ON



ASYSTOLE	ON	5 [s]	
VT	ON	100 [bpm]	6 [beats]
EXT TACHY	OFF	160 [bpm]	
EXT BRADY	OFF	40 [bpm]	
VPC RUN	ON	100 [bpm]	3 [beats]
V BRADY	ON	50 [bpm]	
SV TACHY	OFF	170 [bpm]	6 [beats]
PAUSE	ON	3.0 [s]	
PACER NON-CAPTURE	OFF	400 [ms]	

3. Press the [Home] key to return to the home screen.

Interbed Alarm

When the bedside monitor is connected to a central monitor network, the bedside monitor data can be sent to the central monitor. The bedside monitor can display monitoring data of up to 16 other beds in the network on the INTERBED window. When an alarm occurs at an interbed bed, the highlighted “ALARM bed name” of the alarmed interbed appears in the alarm priority color on the home screen and “Ping” sounds are generated three times if you have previously registered the other bed as an “interbed” bed on the INTERBED window. The interbed alarm can be silenced from this bedside monitor. The alarm silence time depends on the setting on the alarmed bed. The interbed alarm can only be suspended on the alarmed bed. Interbed alarm on or off can also be set.

To silence the interbed alarm, touch the SILENCE ALARM key on the VIEW OTHER BEDS page of the INTERBED window. The alarm sound is also silenced and the alarm indicator turns off on the alarmed bed.

When this monitor is monitored by another monitor with the interbed function, the other monitor can silence alarms on this monitor.

NOTE: The monitor must be connected to a network to use the interbed function.

To monitor alarms of the interbed beds, the following settings must be set.

- Register the beds to be managed by the interbed function on this monitor
- Set <INTERBED ALARM> on the SETTINGS window of the INTERBED window to ON
- Set <AUTO INTERBED DISPLAY> on the SETTINGS window of the INTERBED window to ON to automatically display the VIEW OTHER BEDS window when an alarm occurs on that bed

CAUTION

The interbed window only appears on the home screen when an interbed alarm occurs and <AUTO INTERBED DISPLAY> is set to ON.

Review Windows

General

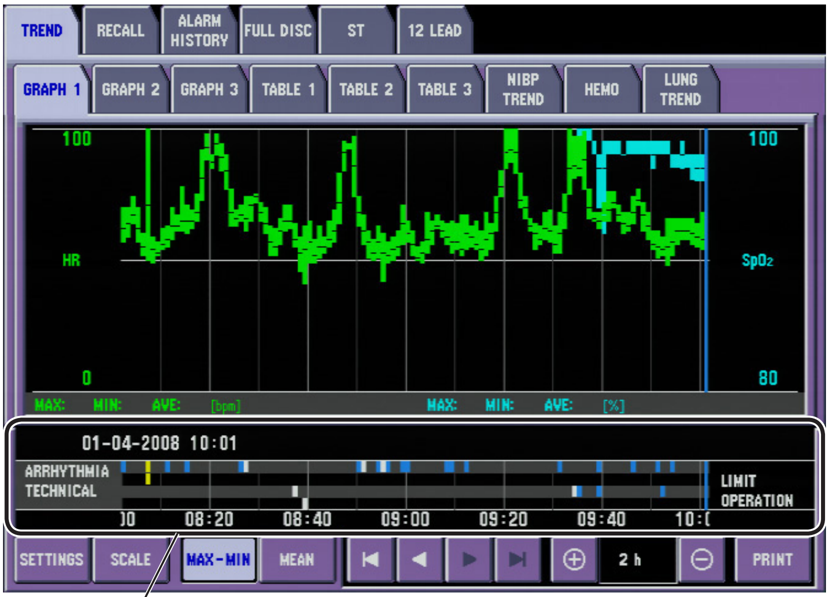
You can review saved data on the following review windows. You can expand the memory of the monitor from 128 MB to 1 GB with the optional QM-601P memory card. The parentheses show the capacity when the QM-601P memory card is installed in the monitor.

- TREND window
  - GRAPH page: Displays the trendgraph of the past 24 hours (72 hours).
  - TABLE page: Displays the vital sign data of the past 24 hours (72 hours).
  - NIBP TREND page: Displays vital sign data at the NIBP measurement. Up to 512 files (1,024 files) can be saved.
  - HEMO page: Displays the hemodynamic data when CO is measured. Up to 512 files (1,024 files) can be saved.
  - LUNG TREND page: Displays data acquired at the lung function measurement. Up to 128 files (128 files) can be saved.
- RECALL window: Displays arrhythmia waveforms of 4 seconds before and 4 seconds after the arrhythmia detection. Up to 8,192 files (16,384 files) can be saved.
- ALARM HISTORY window: Displays the table of vital sign alarms and arrhythmia alarms. Up 8,192 files (16,384 files) can be saved.
- FULL DISC window: Displays up to 24 hours (72 hours) of compressed and expanded waveforms of up to 5 parameters.
- ST window: Displays the ST level waveforms of the past 24 hours (72 hours). All monitoring ECG can be saved. ST window is available when the site setting is OR or ICU.
- 12 LEAD window: Displays the 12 lead analysis result data of up to 6 files (18 files). Refer to the “12 LEAD/12 LEAD ANALYSIS Windows” section.
- OCRG window: Displays the OCRG trendgraph of the past 24 hours (72 hours). OCRG window is available when the site setting is NICU.

NOTE:

- When <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON, the stored data in the monitor will be deleted if the power is turned off for more than 30 minutes. When <AUTO ADMIT> is set to OFF, you can select whether to save the settings or initialize the master settings.
- The oldest file is deleted when the maximum number of files are saved.
- Do not disconnect the power cord while the monitor power is on. Data may be lost.

Event Bar


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
100
HR
0
100
SpO2
80
MAX: MIN: AVE: [bpm]
MAX: MIN: AVE: [%]
01-04-2008 10:01
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
)0 08:20 08:40 09:00 09:20 09:40 10:(
SETTINGS
SCALE
MAX-MIN
MEAN
2 h
PRINT

Event bar

The event bar is displayed at the lower part of the review window. The event bar shows the event occurrence during monitoring.

You can change event bar time interval by touching the ⊕ or ⊖ key under the event bar. When the ⊕ key is touched, the interval changes 24 hour → 8 hour → 4 hour → 2 hour → 1 hour. When the ⊖ key is touched, the interval changes 1 hour → 2 hour → 4 hour → 8 hour → 24 hour.

The event bar can be scrolled by touching the ⏮, ◀, ▶ or ⏭ key under the event bar.

Up to four events from ARRHYTHMIA (arrhythmia alarms), TECHNICAL (technical alarms), LIMIT (vital sign alarms) and OPERATION (when SILENCE ALARM, SUSPEND ALARMS, ALL ALARMS OFF, BYPASS, SUSPEND MONITORING starts) can be displayed.

TREND Window

GRAPH 1, GRAPH 2, GRAPH 3 Page

There are 3 trend graph pages. Each page displays up to 6 parameters of the past 24 hours. With the optional QM-601P memory card, data of past 72 hours can be saved.

The screen example is when 2 parameters are selected on the SETTINGS window. On the SETTINGS window, you can select parameters and on the SCALE window you can select each scale for the trendgraph display. To change the time threshold for the apnea trendgraph, select the interval in <APNEA TREND TIME> box on the SETTINGS window. You can select to display maximum and minimum values or mean values for the trendgraph display.

Press the [Menu] key → TREND key → GRAPH 1, GRAPH 2 or GRAPH 3 tab to display the TREND GRAPH page.

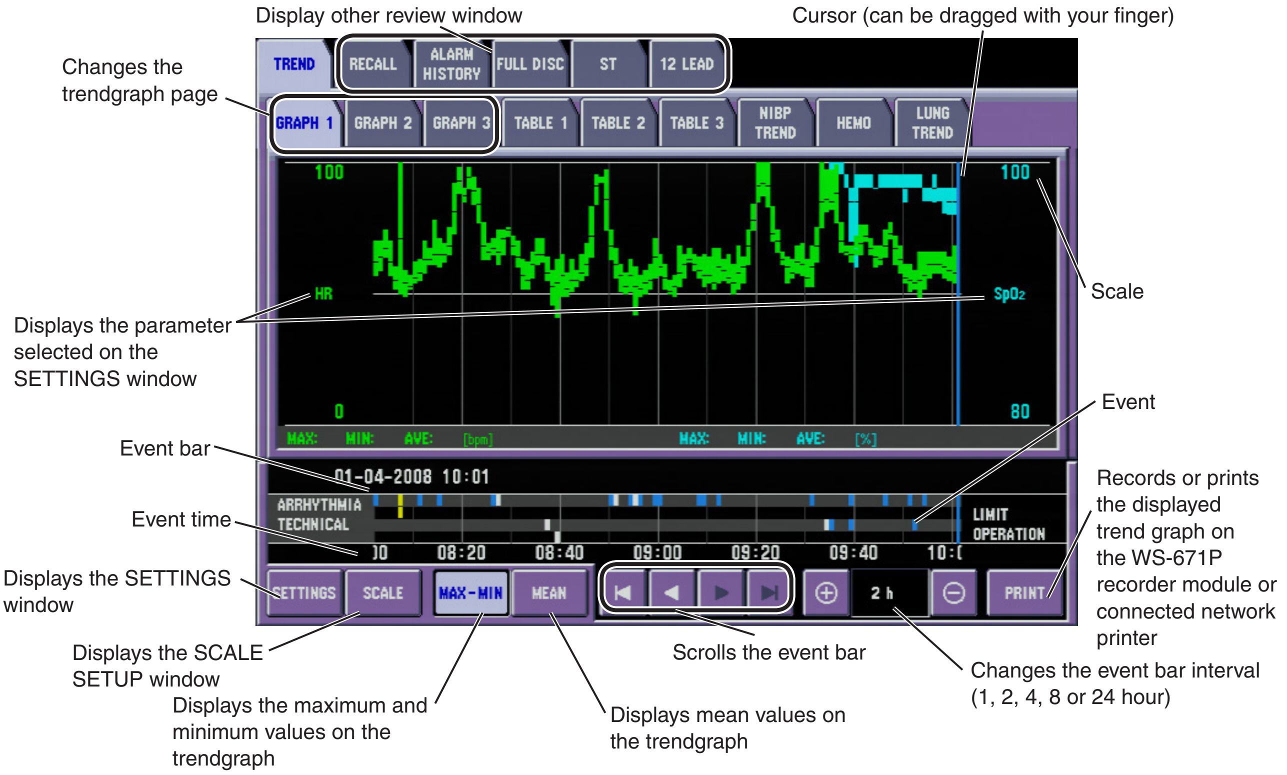
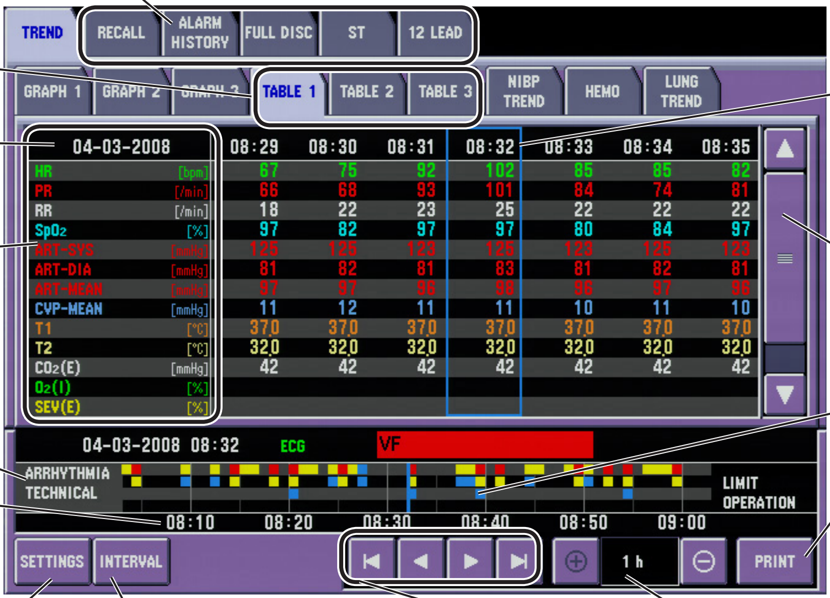

Display other review window
Cursor (can be dragged with your finger)
Changes the trendgraph page
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
100
100
HR
SpO2
Scale
Displays the parameter selected on the SETTINGS window
0
80
MAX: MIN: AVE: [bpm]
MAX: MIN: AVE: [%]
Event
Event bar
01-04-2008 10:01
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
Event time
08:20
08:40
09:00
09:20
09:40
Records or prints the displayed trend graph on the WS-671P recorder module or connected network printer
Displays the SETTINGS window
SETTINGS
SCALE
MAX-MIN
MEAN
2 h
PRINT
Displays the SCALE SETUP window
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)
Displays the maximum and minimum values on the trendgraph
Displays mean values on the trendgraph

TABLE 1, TABLE 2, TABLE 3 Page

There are 3 table pages. Each page displays the vital sign data of the past 24 hours. With the optional QM-601P memory card, data of past 72 hours can be saved.

The data of all monitoring parameters can be displayed on the TREND TABLE page. The data of the selected parameters at the selected interval are displayed. Select the parameters to be displayed on the SETTINGS window on the TABLE 1 to TABLE 3 page.

Press the [Menu] key → TREND key → TABLE 1, TABLE 2 or TABLE 3 tab to display the TREND TABLE page.


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
08:10
08:20
08:30
08:40
08:50
09:00
SETTINGS
INTERVAL
1 h
PRINT

04-03-2008		08:29	08:30	08:31	08:32	08:33	08:34	08:35
HR	[bpm]	67	75	92	102	85	85	82
PR	[/min]	66	68	93	101	84	74	81
RR	[/min]	18	22	23	25	22	22	22
SpO2	[%]	97	82	97	97	80	84	97
ART-SYS	[mmHg]	125	125	123	125	123	125	123
ART-DIA	[mmHg]	81	82	81	83	81	82	81
ART-MEAN	[mmHg]	97	97	96	98	96	97	96
CVP-MEAN	[mmHg]	11	12	11	11	10	11	10
T1	[°C]	37.0	37.0	37.0	37.0	37.0	37.0	37.0
T2	[°C]	32.0	32.0	32.0	32.0	32.0	32.0	32.0
CO2(E)	[mmHg]	42	42	42	42	42	42	42
O2(I)	[%]							
SEV(E)	[%]							

04-03-2008 08:32 ECG VF

Display other review window

Changes the trend data page

Date and time

Displays the parameters selected in the SETTINGS window

Event bar

Event time

Displays the SETTINGS window

Displays the INTERVAL SETUP window

Scrolls the event bar

Changes the event bar interval (1, 2, 4, 8 or 24 hour)

Selected file

Scroll to display other parameter data

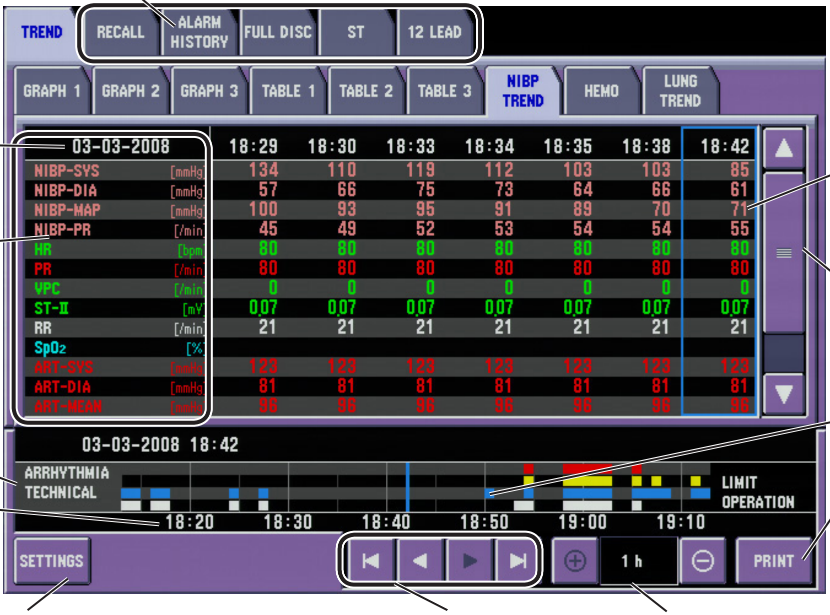
Event

Records or prints the trend data of the selected time period on the WS-671P recorder module or connected network printer

NIBP TREND Page

The NIBP TREND page displays data of the selected parameters at the NIBP measurement. Select the parameters to be displayed on the SETTINGS window of the NIBP TREND page. Displays the vital sign data at the NIBP measurement of up to 512 files. With the optional QM-601P memory card, data of up to 1,024 files can be saved.

Press the [Menu] key → TREND key → NIBP TREND tab to display the NIBP TREND page.


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
18:20
18:30
18:40
18:50
19:00
19:10
SETTINGS
1 h
PRINT

03-03-2008		18:29	18:30	18:33	18:34	18:35	18:38	18:42
NIBP-SYS	[mmHg]	134	110	119	112	103	103	85
NIBP-DIA	[mmHg]	57	66	75	73	64	66	61
NIBP-MAP	[mmHg]	100	93	95	91	89	70	71
NIBP-PR	[/min]	45	49	52	53	54	54	55
HR	[bpm]	80	80	80	80	80	80	80
PR	[/min]	80	80	80	80	80	80	80
VPC	[/min]	0	0	0	0	0	0	0
ST-II	[mV]	0.07	0.07	0.07	0.07	0.07	0.07	0.07
RR	[/min]	21	21	21	21	21	21	21
SpO_2	[%]							
ART-SYS	[mmHg]	123	123	123	123	123	123	123
ART-DIA	[mmHg]	81	81	81	81	81	81	81
ART-MEAN	[mmHg]	96	96	96	96	96	96	96

03-03-2008 18:42

Display other review window

Date and time

Displays the parameters selected in the SETTINGS window

Event bar

Event time

Displays the SETTINGS window

Scrolls the event bar

Changes the event bar interval (1, 2, 4, 8 or 24 hour)

Selected file

Scroll to display other parameter data

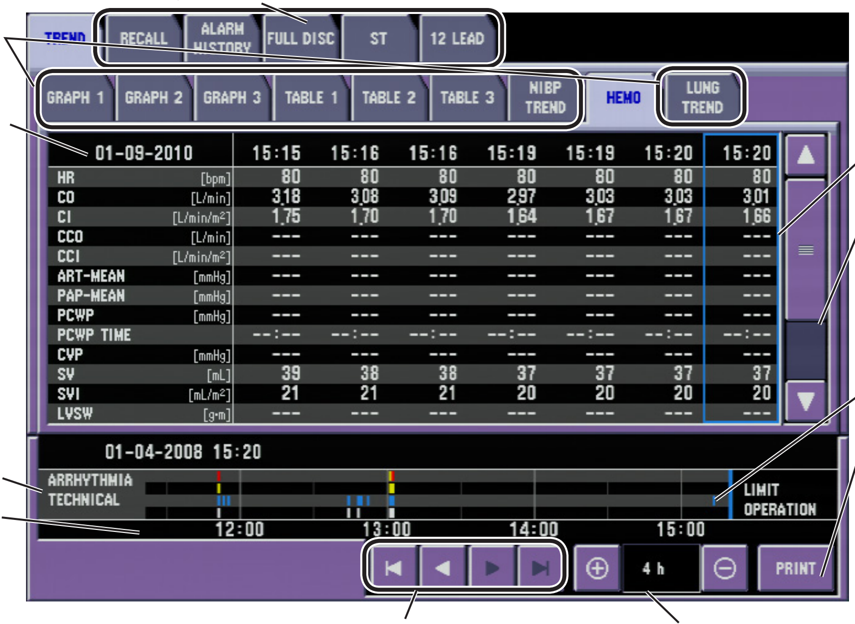
Event

Records or prints the NIBP data of the selected time period on the WS-671P recorder module or connected network printer

HEMO Page

The HEMO page displays the hemodynamics table when cardiac output is measured and the measured values are added to the hemodynamics table. When cardiac output is monitored by the CCO monitor, measured values are also added to the hemodynamics table. Up to 512 files of the hemodynamic data are displayed when CO is monitored. With the optional QM-601P memory card, data of up to 1,024 files can be saved.

Press the [Menu] key → TREND key → HEMO tab to display the HEMO page.


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
01-04-2008 15:20
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
12:00
13:00
14:00
15:00
4 h
PRINT

01-09-2010	15:15	15:16	15:16	15:19	15:19	15:20	15:20
HR [bpm]	80	80	80	80	80	80	80
CO [L/min]	3.18	3.08	3.09	2.97	3.03	3.03	3.01
CI [L/min/m^2]	1.75	1.70	1.70	1.64	1.67	1.67	1.66
CCO [L/min]	---	---	---	---	---	---	---
CCI [L/min/m^2]	---	---	---	---	---	---	---
ART-MEAN [mmHg]	---	---	---	---	---	---	---
PAP-MEAN [mmHg]	---	---	---	---	---	---	---
PCWP [mmHg]	---	---	---	---	---	---	---
PCWP TIME	--:--	--:--	--:--	--:--	--:--	--:--	--:--
CVP [mmHg]	---	---	---	---	---	---	---
SV [mL]	39	38	38	37	37	37	37
SVI [mL/m^2]	21	21	21	20	20	20	20
LVSW [g·m]	---	---	---	---	---	---	---

Display other review window

Display other trend window

Measured date and time

Selected file

Scrolls time

Event

Event bar

Event time

Records or prints the hemodynamics data of the selected time period on the WS-671P recorder module or connected network printer

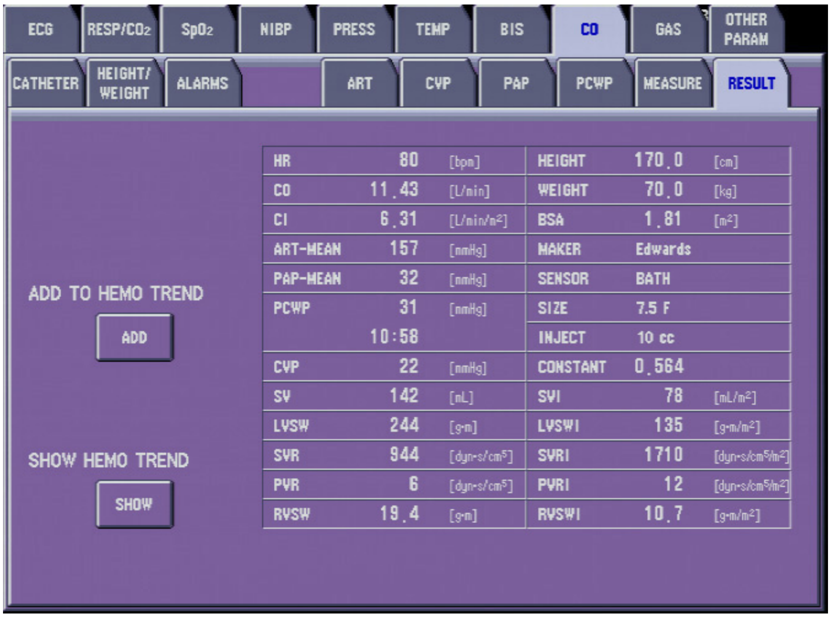
Scrolls the event bar

Changes the event bar interval (1, 2, 4, 8 or 24 hour)

Registering the Acquired Data to the Hemodynamics Table Window

The acquired CO data can be added to the hemodynamics table in the HEMO window. When data is added to the HEMO window, the data disappears from the home screen and CO window. "- - -" appears on the CO data display area on the screen.

1. Display the RESULT page of the CO window.
   Press the [Menu] key → CO key → RESULT tab.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
ADD TO HEMO TREND
ADD
SHOW HEMO TREND
SHOW

HR	80	[bpm]	HEIGHT	170.0	[cm]
CO	11.43	[L/min]	WEIGHT	70.0	[kg]
CI	6.31	[L/min/m^2]	BSA	1.81	[m^2]
ART-MEAN	157	[mmHg]	MAKER	Edwards	
PAP-MEAN	32	[mmHg]	SENSOR	BATH	
PCWP	31	[mmHg]	SIZE	7.5 F	
	10:58		INJECT	10 cc	
CVP	22	[mmHg]	CONSTANT	0.564	
SV	142	[mL]	SVI	78	[mL/m^2]
LVSW	244	[g·m]	LVSWI	135	[g·m/m^2]
SVR	944	[dyn·s/cm^5]	SVRI	1710	[dyn·s/cm^5/m^2]
PVR	6	[dyn·s/cm^5]	PVRI	12	[dyn·s/cm^5/m^2]
RVSW	19.4	[g·m]	RVSWI	10.7	[g·m/m^2]

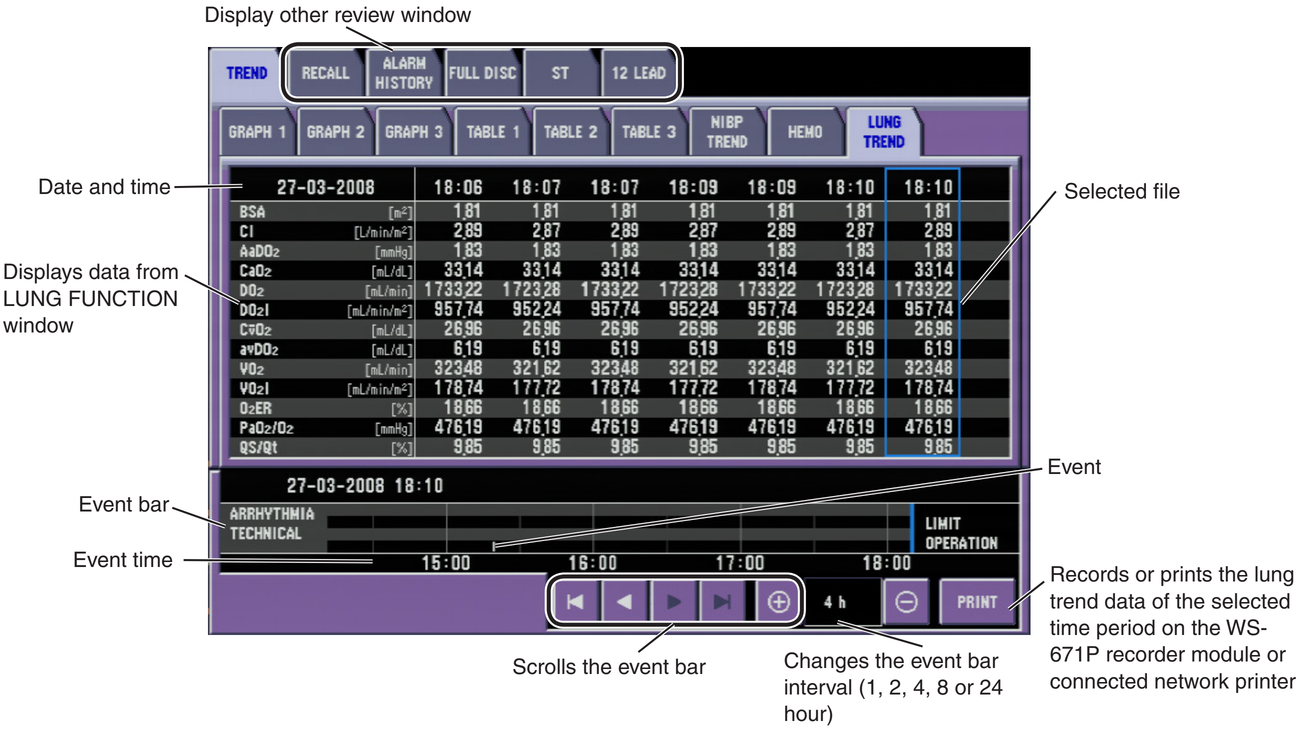
2. Touch the ADD key under <ADD TO HEMO TREND>. The data on the RESULT window is registered to the HEMO window.

3. Touch the SHOW key under <SHOW HEMO TREND> to display the HEMO window. The registered CO data is displayed in the HEMO window.

LUNG TREND Page

The LUNG TREND page displays data acquired at the lung function measurement from the LUNG FUNCTION window. The files of past 24 hours or up to 128 files can be saved. Refer to the “DRUG/ LUNG FUNCTION Windows” section.

Press the [Menu] key → TREND key → LUNG TREND tab to display the LUNG TREND page.


Display other review window
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
Date and time
Displays data from LUNG FUNCTION window
Selected file
Event
Event bar
Event time
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
15:00
16:00
17:00
18:00
4 h
PRINT
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)
Records or prints the lung trend data of the selected time period on the WS-671P recorder module or connected network printer

27-03-2008		18:06	18:07	18:07	18:09	18:09	18:10	18:10
BSA	[m²]	1.81	1.81	1.81	1.81	1.81	1.81	1.81
CI	[L/min/m²]	2.89	2.87	2.89	2.87	2.89	2.87	2.89
AaDO2	[mmHg]	1.83	1.83	1.83	1.83	1.83	1.83	1.83
CaO2	[mL/dL]	33.14	33.14	33.14	33.14	33.14	33.14	33.14
DO2	[mL/min]	1733.22	1723.28	1733.22	1723.28	1733.22	1723.28	1733.22
DO2I	[mL/min/m²]	957.74	952.24	957.74	952.24	957.74	952.24	957.74
Cv̄O2	[mL/dL]	26.96	26.96	26.96	26.96	26.96	26.96	26.96
avDO2	[mL/dL]	6.19	6.19	6.19	6.19	6.19	6.19	6.19
VO2	[mL/min]	323.48	321.62	323.48	321.62	323.48	321.62	323.48
VO2I	[mL/min/m²]	178.74	177.72	178.74	177.72	178.74	177.72	178.74
O2ER	[%]	18.66	18.66	18.66	18.66	18.66	18.66	18.66
PaO2/O2	[mmHg]	476.19	476.19	476.19	476.19	476.19	476.19	476.19
QS/Qt	[%]	9.85	9.85	9.85	9.85	9.85	9.85	9.85

27-03-2008 18:10

RECALL Window

ARRHYTH HISTORY Page

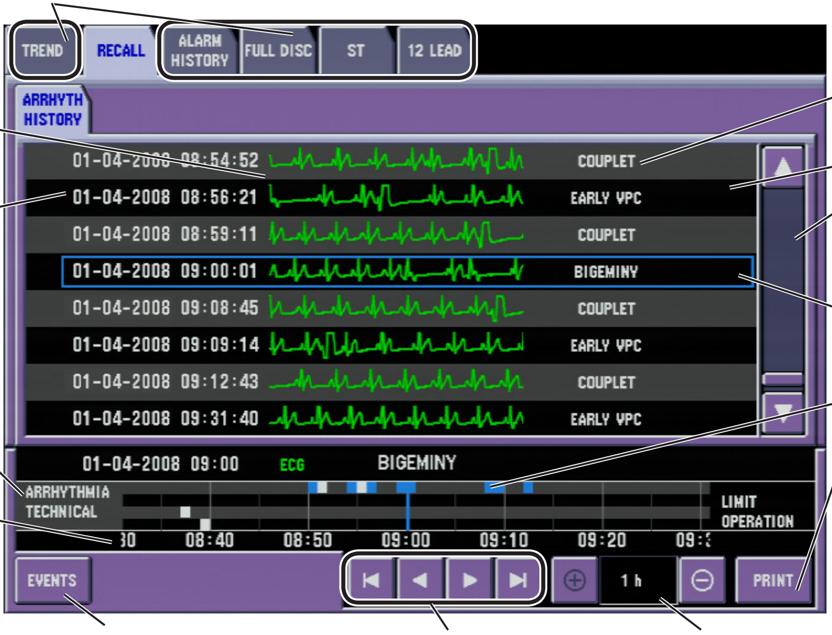
Up to 8,192 files can be saved for arrhythmias. 8 second ECG is saved for each recall file. With the optional QM-601P memory card, data of up to 16,384 files can be saved.

To create arrhythmia recall files:

- <ARRHYTHMIA ANALYSIS> on the ECG window must be set to ON.
- The type of arrhythmias you want to save as files must be selected on the ARRHYTHMIA EVENT SETUP window on the RECALL window.

Press the [Menu] key → RECALL key to display the ARRHYTH HISTORY page.

Display other review window


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
ARRHYTH HISTORY
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
ECG
08:40
08:50
09:00
09:10
09:20
EVENTS
1 h
PRINT

01-04-2008 08:54:52 COUPLET
01-04-2008 08:56:21 EARLY VPC
01-04-2008 08:59:11 COUPLET
01-04-2008 09:00:01 BIGEMINY
01-04-2008 09:08:45 COUPLET
01-04-2008 09:09:14 EARLY VPC
01-04-2008 09:12:43 COUPLET
01-04-2008 09:31:40 EARLY VPC

01-04-2008 09:00 ECG BIGEMINY

Compressed ECG of the recall file

Date and time of file creation

Event bar

Event time

Arrhythmia type

Recall file

Scroll to display other recall files

Selected file

Event

Records or prints the displayed arrhythmia history data on the WS-671P recorder module or connected network printer

Displays the ARRHYTHMIA EVENT SETUP window

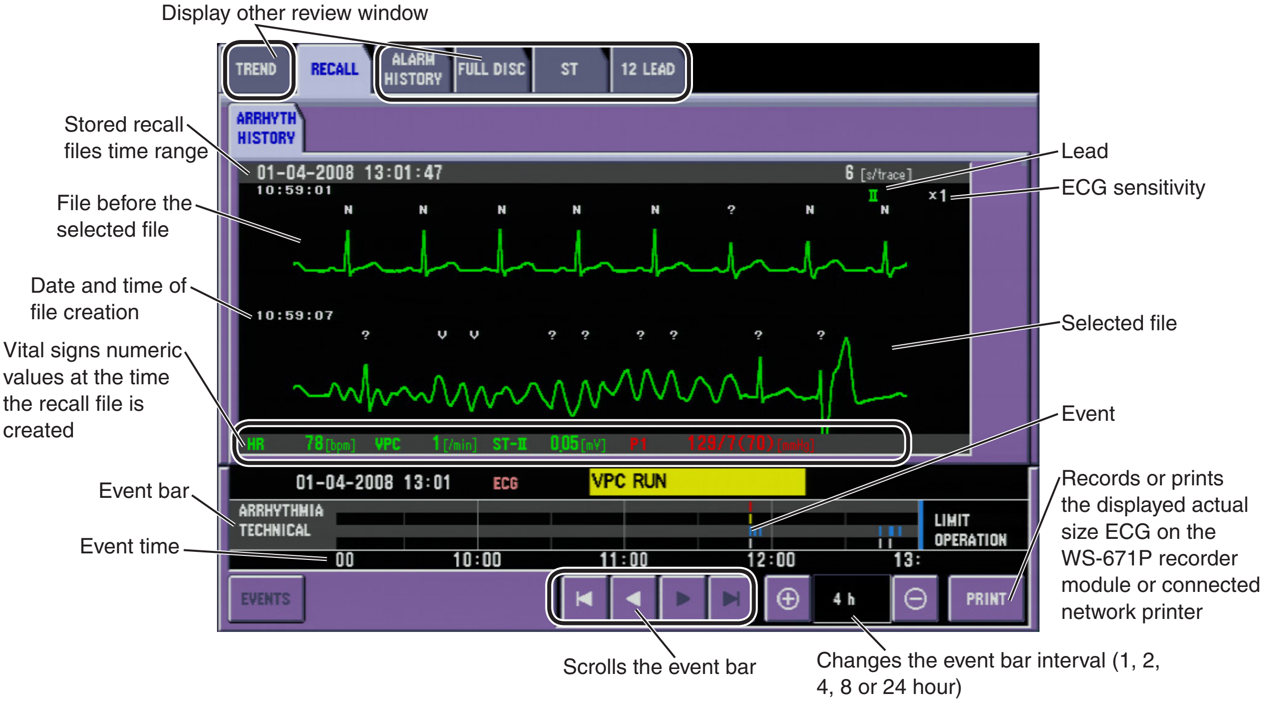
Scrolls the event bar

Changes the event bar interval (1, 2, 4, 8 or 24 hour)

The recall file of past 24 hours can be displayed on the ARRYTH HISTORY window. Use the scroll bar to display other files. Touch the desired file to display the actual size ECG.

Actual Size ECG

The ARRHYTH HISTORY window displays the actual size ECG of the selected recall file with the ECG of one before and one after the selected file.

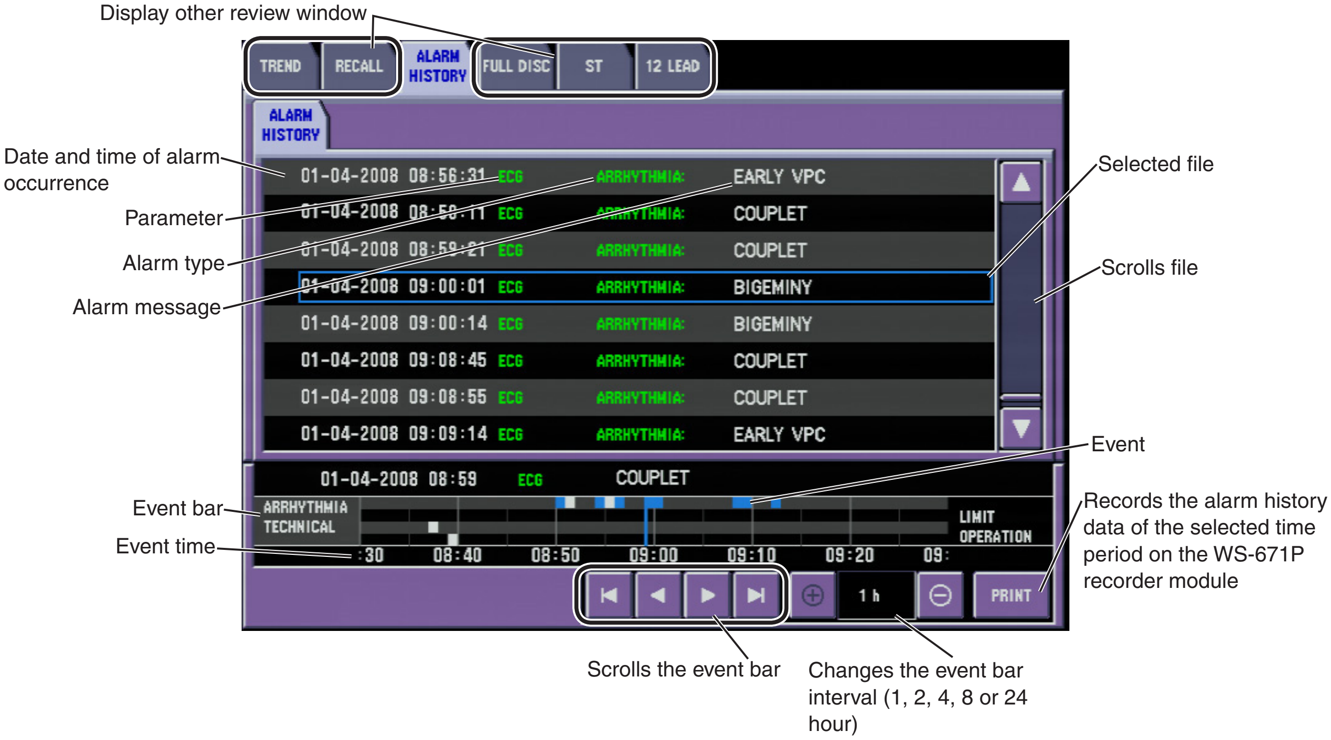

Display other review window
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
ARRHYTH HISTORY
Stored recall files time range
01-04-2008 13:01:47
6 [s/trace]
Lead
II
ECG sensitivity
x1
File before the selected file
10:59:01
N N N N N ? N N
Date and time of file creation
10:59:07
? V V ? ? ? ? ? ?
Selected file
Vital signs numeric values at the time the recall file is created
HR 78 [bpm] VPC 1 [/min] ST-II 0.05 [mV] P1 129/7(70) [mmHg]
Event
01-04-2008 13:01
ECG
VPC RUN
Event bar
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
Event time
00
10:00
11:00
12:00
13:
EVENTS
4 h
PRINT
Records or prints the displayed actual size ECG on the WS-671P recorder module or connected network printer
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)

ALARM HISTORY Window

ALARM HISTORY Page

Displays the history of the past 24 hours. Up to 8,192 files can be saved. With the optional QM-601P memory card, data of up to 16,384 files can be saved.

Press the [Menu] key → ALARM HISTORY key to display the ALARM HISTORY page.


Display other review window
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
ALARM HISTORY
Date and time of alarm occurrence
Parameter
Alarm type
Alarm message
Selected file
Scrolls file
Event
Event bar
Event time
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
:30
08:40
08:50
09:00
09:10
09:20
09:
1 h
PRINT
Records the alarm history data of the selected time period on the WS-671P recorder module
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)

01-04-2008 08:56:31	ECG	ARRHYTHMIA:	EARLY VPC
01-04-2008 08:58:11	ECG	ARRHYTHMIA:	COUPLET
01-04-2008 08:59:21	ECG	ARRHYTHMIA:	COUPLET
01-04-2008 09:00:01	ECG	ARRHYTHMIA:	BIGEMINY
01-04-2008 09:00:14	ECG	ARRHYTHMIA:	BIGEMINY
01-04-2008 09:08:45	ECG	ARRHYTHMIA:	COUPLET
01-04-2008 09:08:55	ECG	ARRHYTHMIA:	COUPLET
01-04-2008 09:09:14	ECG	ARRHYTHMIA:	EARLY VPC

01-04-2008 08:59 ECG COUPLET

FULL DISC Window

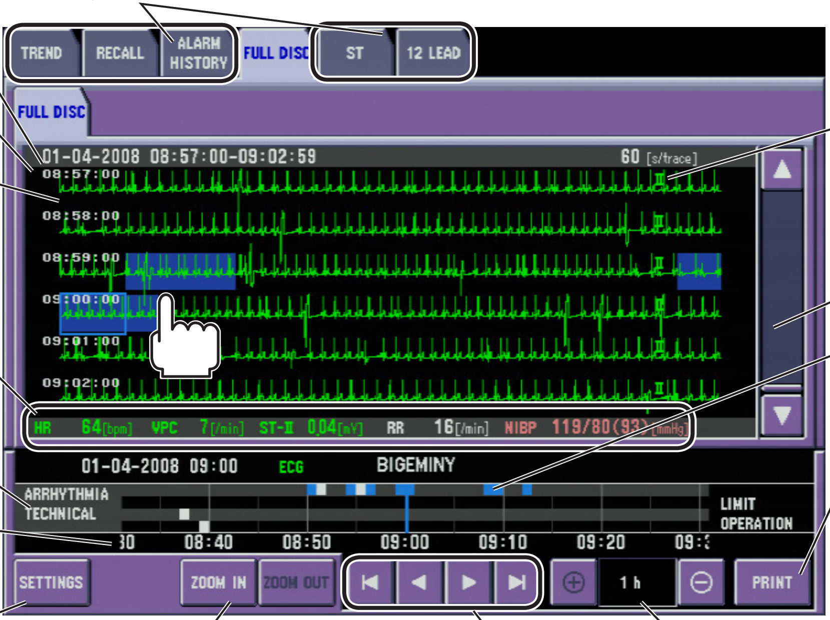
FULL DISC Page

Up to 5 parameter waveforms can be saved for the past 24 hours. With the optional QM-601P memory card, data of past 72 hours can be saved. Up to 4 parameters waveforms can be displayed. The full disclosure waveforms can be zoomed in to display the enlarged waveforms. Select the parameters for the waveform to be saved as the full disclosure on the SETTINGS window.

Press the [Menu] key → FULL DISC key to display the FULL DISC page.

Full Disclosure Waveform

Touch to display the 6 seconds of enlarged waveforms. Touch again to restore the previous display.


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
FULL DISC
01-04-2008 08:57:00-09:02:59
60 [s/trace]
08:57:00
08:58:00
08:59:00
09:00:00
09:01:00
09:02:00
II
HR 64[bpm] VPC 7[/min] ST-II 0.04[mV] RR 16[/min] NIBP 119/80(93)[mmHg]
01-04-2008 09:00 ECG BIGEMINY
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
30 08:40 08:50 09:00 09:10 09:20 09:3
SETTINGS
ZOOM IN
ZOOM OUT
1 h
PRINT

Display other review window

Stored recall files time range

Time of file creation

60 second full disclosure waveform

Vital signs numeric values at the time the recall file is created

Event bar

Event time

ECG lead

Scrolls time

Event

Records or prints the displayed full disclosure data on the WS-671P recorder module or connected network printer

Displays the DISPLAY/ SAVE and WAVEFORMS settings window

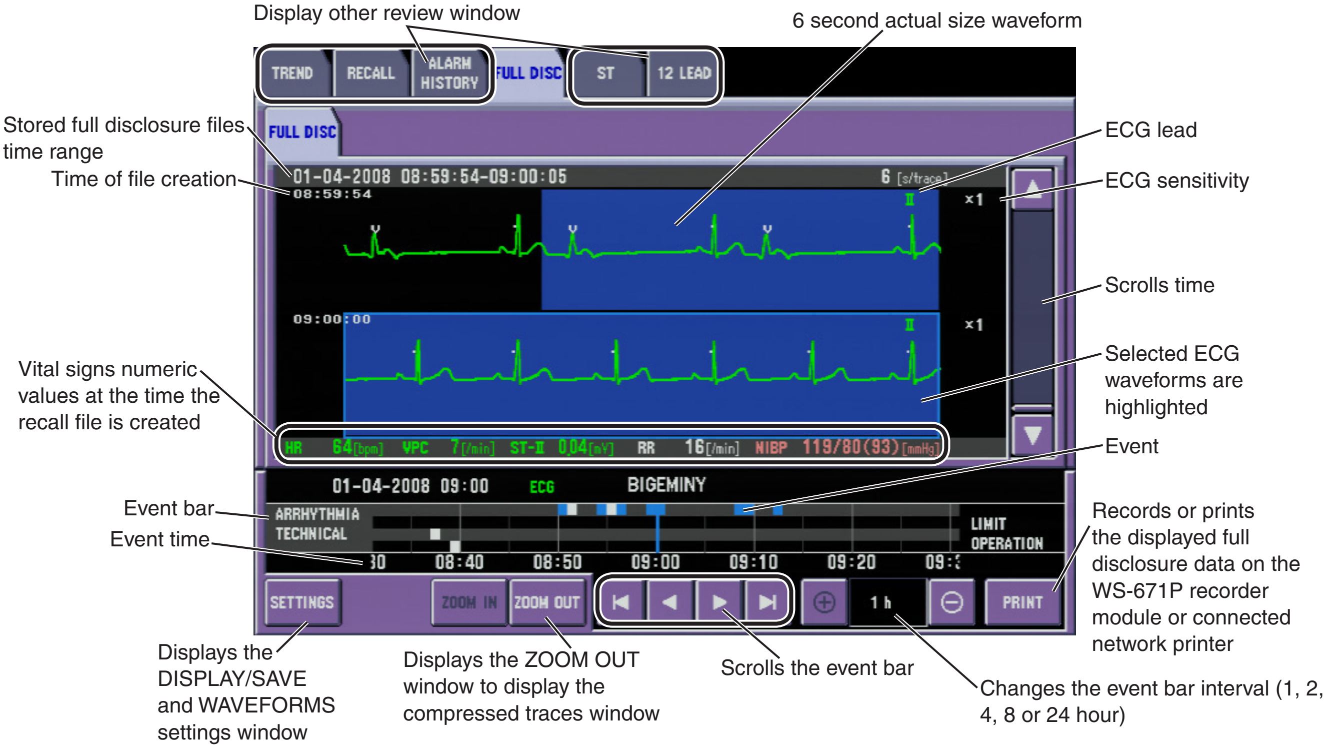
Displays the Zoom In window for the selected waveform. Every touch of the key changes the display range from 60 → 30 →12 → 6 seconds of waveforms.

Scrolls the event bar

Changes the event bar interval (1, 2, 4, 8 or 24 hour)

Zoom In Window

The full disclosure waveform can be displayed in actual size.


Display other review window
6 second actual size waveform
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
Stored full disclosure files time range
Time of file creation
FULL DISC
01-04-2008 08:59:54-09:00:05
08:59:54
09:00:00
6 [s/trace]
II
×1
ECG lead
ECG sensitivity
Scrolls time
Selected ECG waveforms are highlighted
Vital signs numeric values at the time the recall file is created
HR 64[bpm] VPC 7[/min] ST-II 0.04[mV] RR 16[/min] NIBP 119/80(93)[mmHg]
Event
01-04-2008 09:00 ECG BIGEMINY
Event bar
Event time
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
30 08:40 08:50 09:00 09:10 09:20 09:3
Records or prints the displayed full disclosure data on the WS-671P recorder module or connected network printer
SETTINGS
ZOOM IN
ZOOM OUT
1 h
PRINT
Displays the DISPLAY/SAVE and WAVEFORMS settings window
Displays the ZOOM OUT window to display the compressed traces window
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)

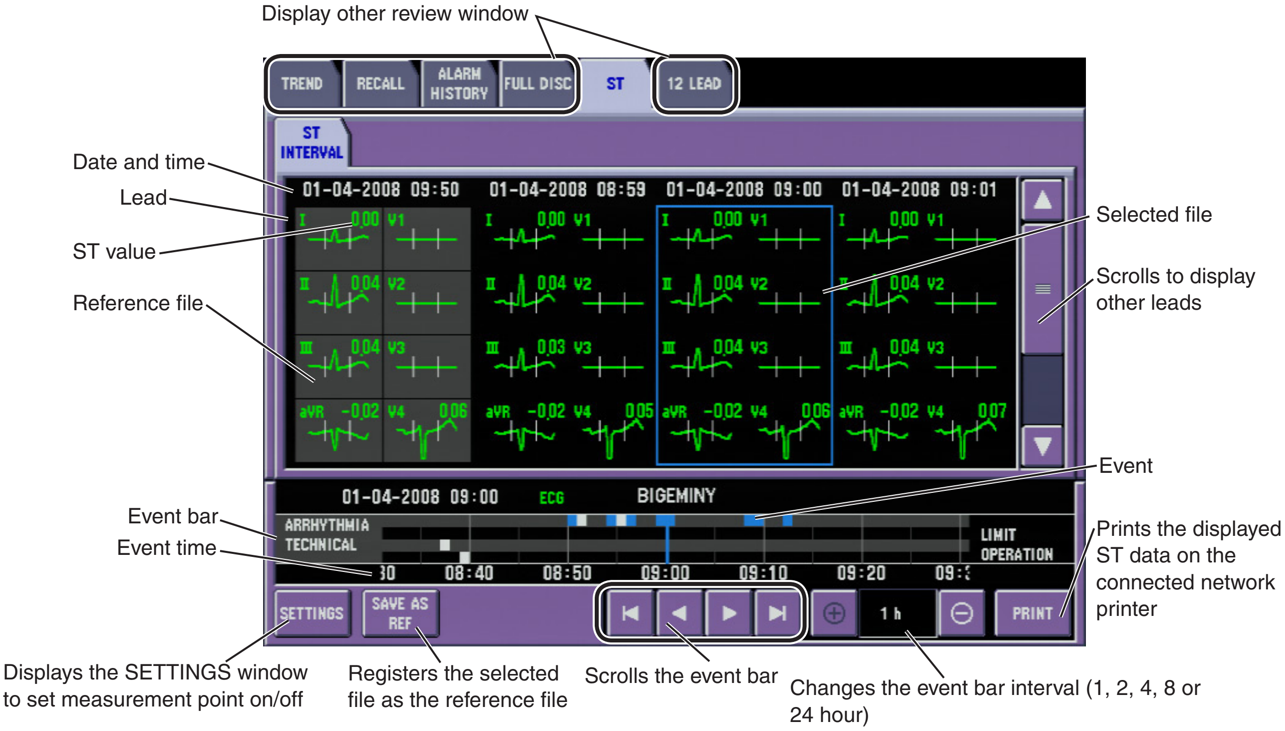
ST Window

ST INTERVAL Page

Displays the past 24 hours of ST waves of all monitoring ECG leads. With the optional QM-601P memory card, data of past 72 hours can be saved. The reference ST waves are also displayed so that you can see the changes on the ST waves.

NOTE: Although the ST algorithm has been tested for accuracy of the ST analysis result, the significance of the ST level changes need to be determined only by a physician.

Press the [Menu] key → ST key to display the ST INTERVAL page.


Display other review window
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
ST INTERVAL
Date and time
Lead
ST value
Reference file
01-04-2008 09:50
01-04-2008 08:59
01-04-2008 09:00
01-04-2008 09:01
Selected file
Scrolls to display other leads
Event
01-04-2008 09:00
ECG
BIGEMINY
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
Event bar
Event time
08:40
08:50
09:00
09:10
09:20
SETTINGS
SAVE AS REF
1 h
PRINT
Prints the displayed ST data on the connected network printer
Displays the SETTINGS window to set measurement point on/off
Registers the selected file as the reference file
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)

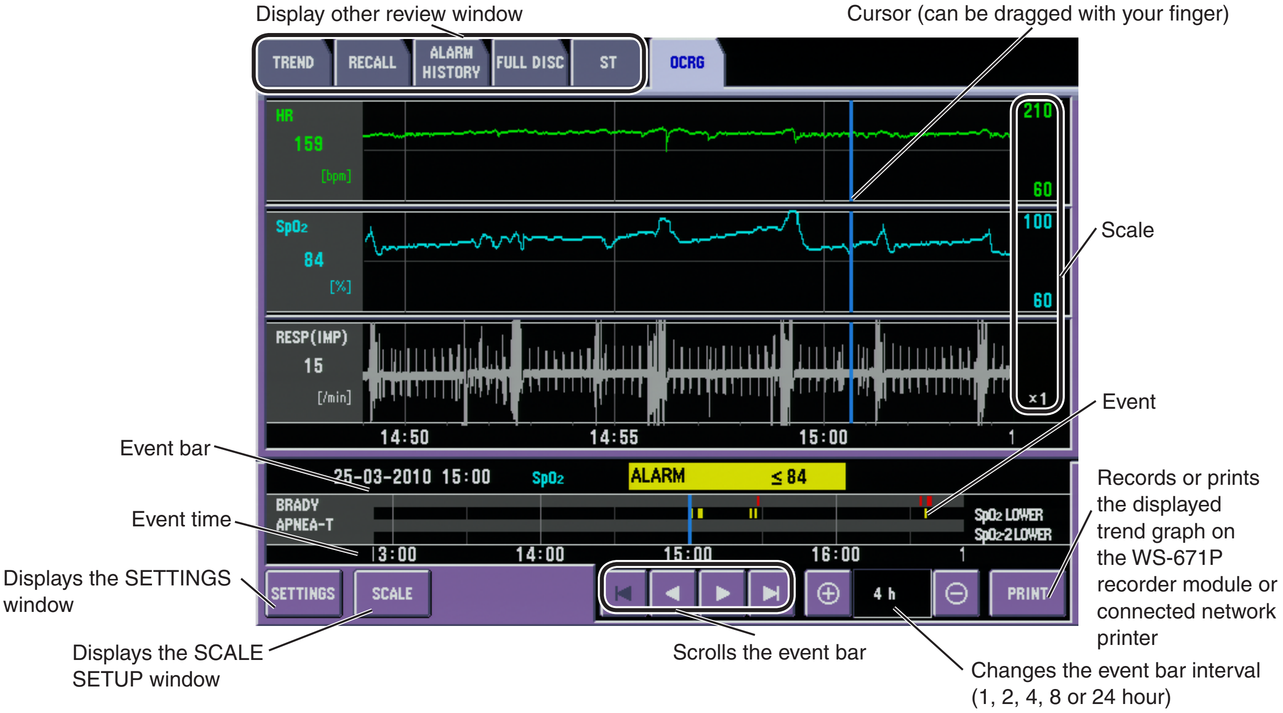
OCRG Window

Displays the past 24 hours of OCRG trendgraph. With the optional QM-601P memory card, data of past 72 hours can be saved.

On the SETTINGS window, you can select the OCRG trendgraph type of 1 cm/min or 3 cm/min and on the SCALE window, you can select the scale for the heart rate, SpO_2 and impedance respiration trendgraph display.

NOTE: The OCRG window is available only when the site setting is NICU.

Press the [Menu] key → OCRG key to display the OCRG window.


Display other review window
Cursor (can be dragged with your finger)
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
OCRG
HR
159
[bpm]
210
60
SpO2
84
[%]
100
60
RESP(IMP)
15
[/min]
x1
14:50
14:55
15:00
Scale
Event
Event bar
25-03-2010 15:00
SpO2
ALARM
≤84
Event time
BRADY
APNEA-T
SpO2 LOWER
SpO2-2 LOWER
13:00
14:00
15:00
16:00
Displays the SETTINGS window
SETTINGS
SCALE
4 h
PRINT
Records or prints the displayed trend graph on the WS-671P recorder module or connected network printer
Displays the SCALE SETUP window
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)

12 LEAD/12 LEAD ANALYSIS Windows

General

When 12 lead ECG is monitored, ECG can be analyzed on the 12 LEAD ANALYSIS window and the analysis result and clinical findings can be displayed on the 12 LEAD window. Up to 6 files can be saved. With the optional QM-601P memory card, data of up to 18 files can be saved.

The 12 LEAD window has the following pages to display the analysis result and clinical findings.
- 12 LEAD page for displaying the 12 lead analysis result data.
- ANALYSIS WAVE page for displaying ECG waveforms used for analysis.
- AVERAGE WAVE page for displaying averaged ECG waveforms.
- REPORT page for displaying clinical findings.

NOTE:
- 12 lead analysis is not available when an AY-660P input unit is used.
- 12 LEAD and 12 LEAD ANALYSIS windows are not available when the site setting is NICU.
- ECG must be monitored with 10 electrodes to perform 12 lead ECG interpretation. ECG cannot be analyzed when monitoring with 3 or 6 electrodes.
- The oldest file is deleted when the maximum number of files are created.
- The stored data remains in memory for about 30 minutes after the power is turned off. After 30 minutes, the stored data is lost.
- Do not disconnect the power cord while the monitor power is on. Data may be lost.

12 LEAD ANALYSIS Window

Performing 12 Lead ECG Interpretation

WARNING

Do not use 12 lead ECG interpretation results and measured values from the Mason-Likar modification for diagnosis because the limb electrode placement is not the same as the standard 12 lead ECG. This may cause wrong diagnosis since 12 lead ECG interpretation of this monitor is based on the standard 12 lead ECG.

CAUTION

- The 12 lead ECG interpretation is performed for acquired ECG waveforms only and does not reflect all conditions of the patient. The results of the analysis might not correspond to the judgement of a physician.
- Overall judgement must be performed by the physician, referring to the analysis result, clinical findings and other examination results. After the physician's overall judgement, the analysis results should be signed or initialed by the physician.

CAUTION

When the gender is not specified, 12 lead ECG interpretation is performed with the patient as male.

CAUTION

When the date of birth or age is not entered, 12 lead ECG interpretation is performed with the patient as 35 years old.

NOTE:

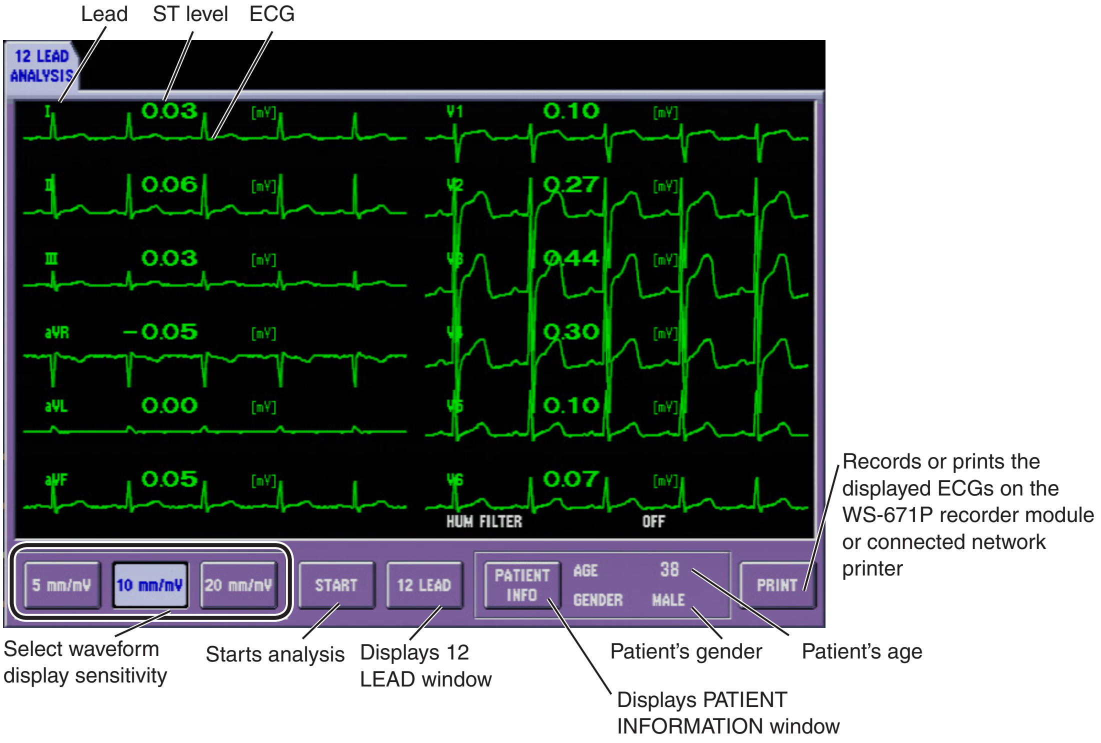
- When electrodes are not attached to the limbs, the analysis result concerning the ECG axis (such as axis deviation) may differ from the analysis with electrodes attached to limbs.
- When analyzing the pacemaker patient, set the pacing spike detection on the ECG window to ON.
- Refer to the ECAPS12C ECG Interpretation Program User's Guide for details about the analysis and the clinical findings.

1. Display the PATIENT INFORMATION window and check that the age and gender are correct.
   Press the [Menu] key → 12 LEAD ANALYSIS key → PATIENT INFO key.

2. Check that the electrodes are attached to the patient and leads are connected appropriately.

3. Display the 12 LEAD ANALYSIS window and check that ECGs on the window are stable.
   Press the [Menu] key → 12 LEAD ANALYSIS key.

NOTE: When the age and/or gender is not entered, the "ENTER DATE OF BIRTH AND GENDER" message appears.


Lead
ST level
ECG
12 LEAD ANALYSIS
5 mm/mV
10 mm/mV
20 mm/mV
START
12 LEAD
PATIENT INFO
PRINT
Records or prints the displayed ECGs on the WS-671P recorder module or connected network printer
Select waveform display sensitivity
Starts analysis
Displays 12 LEAD window
Patient's gender
Patient's age
Displays PATIENT INFORMATION window

Lead	ST level		Lead	ST level	
I	0.03	[mV]	V1	0.10	[mV]
II	0.06	[mV]	V2	0.27	[mV]
III	0.03	[mV]	V3	0.44	[mV]
aVR	−0.05	[mV]	V4	0.30	[mV]
aVL	0.00	[mV]	V5	0.10	[mV]
aVF	0.05	[mV]	V6	0.07	[mV]

HUM FILTER OFF

AGE 38

GENDER MALE

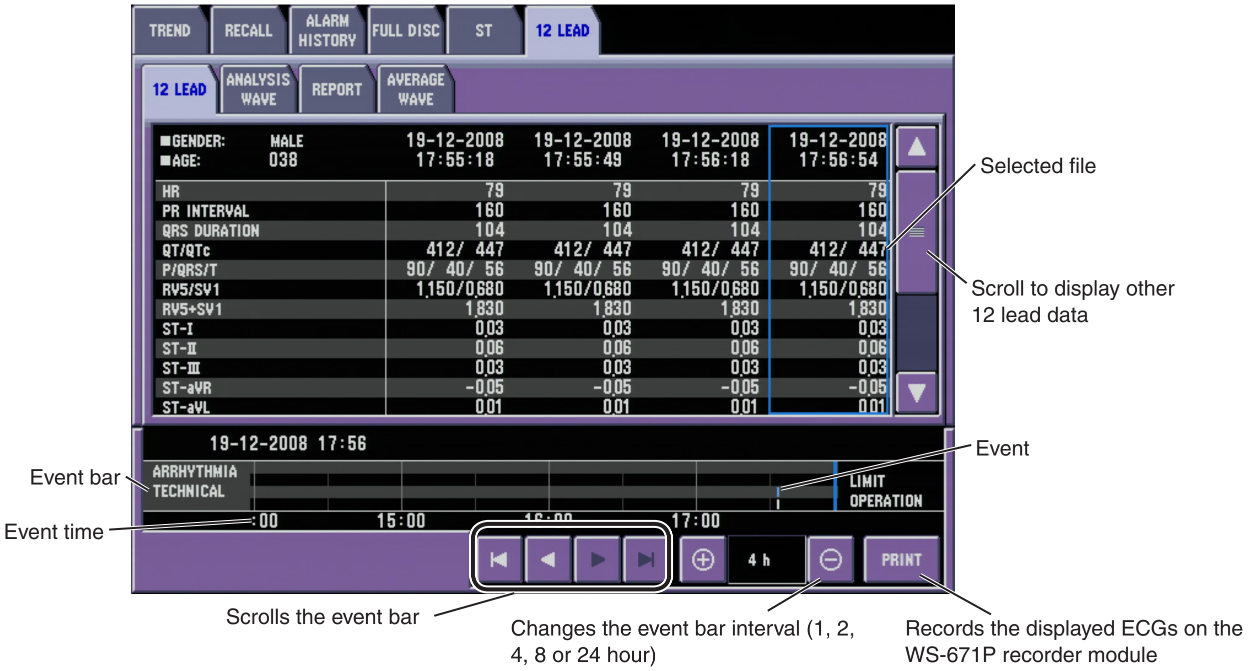
4. Touch the START key to start analyzing ECGs. The "SAVING. PLEASE WAIT" message appears and 10 second ECG of all leads are acquired and analyzed.

   When analyzing is complete, the "ANALYZING. PLEASE WAIT" message disappears and the 12 LEAD window is displayed.

12 LEAD Window

Viewing the 12 Lead Analysis Result

To see the 12 lead analysis result data, touch the 12 LEAD tab.

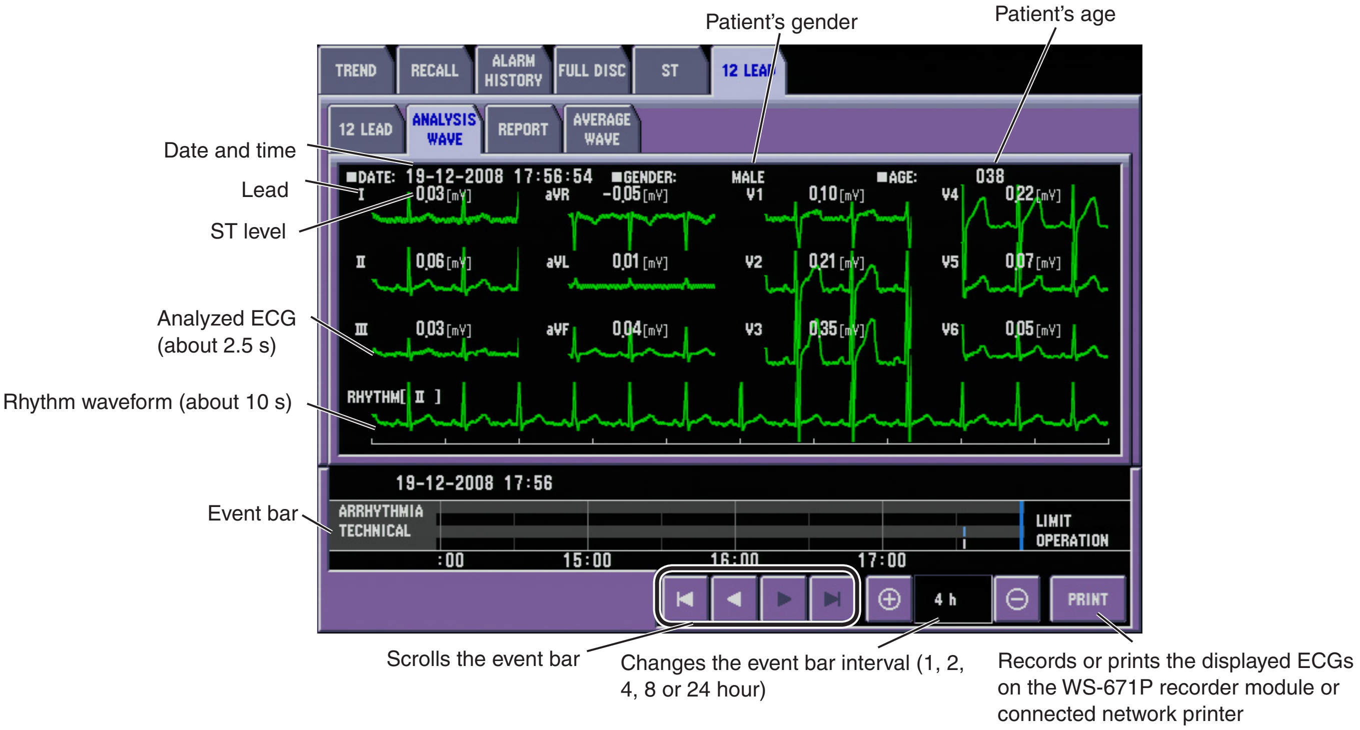


■GENDER: MALE ■AGE: 038	19-12-2008 17:55:18	19-12-2008 17:55:49	19-12-2008 17:56:18	19-12-2008 17:56:54
HR	79	79	79	79
PR INTERVAL	160	160	160	160
QRS DURATION	104	104	104	104
QT/QTc	412/ 447	412/ 447	412/ 447	412/ 447
P/QRS/T	90/ 40/ 56	90/ 40/ 56	90/ 40/ 56	90/ 40/ 56
RV5/SV1	1.150/0.680	1.150/0.680	1.150/0.680	1.150/0.680
RV5+SV1	1.830	1.830	1.830	1.830
ST-I	0.03	0.03	0.03	0.03
ST-II	0.06	0.06	0.06	0.06
ST-III	0.03	0.03	0.03	0.03
ST-aVR	-0.05	-0.05	-0.05	-0.05
ST-aVL	0.01	0.01	0.01	0.01

19-12-2008 17:56

TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
12 LEAD
ANALYSIS WAVE
REPORT
AVERAGE WAVE
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
:00
15:00
16:00
17:00
4 h
PRINT
Selected file
Scroll to display other 12 lead data
Event
Event bar
Event time
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)
Records the displayed ECGs on the WS-671P recorder module

To see the analyzed waveforms, touch the ANALYSIS WAVE tab. About 2.5 seconds of the ECG of each lead and 10 seconds of rhythm waveform (lead II) used for the analysis are displayed.



■DATE: 19-12-2008 17:56:54 ■GENDER: MALE ■AGE: 038

I 0.03 [mV] aVR -0.05 [mV] V1 0.10 [mV] V4 0.22 [mV]

II 0.06 [mV] aVL 0.01 [mV] V2 0.21 [mV] V5 0.07 [mV]

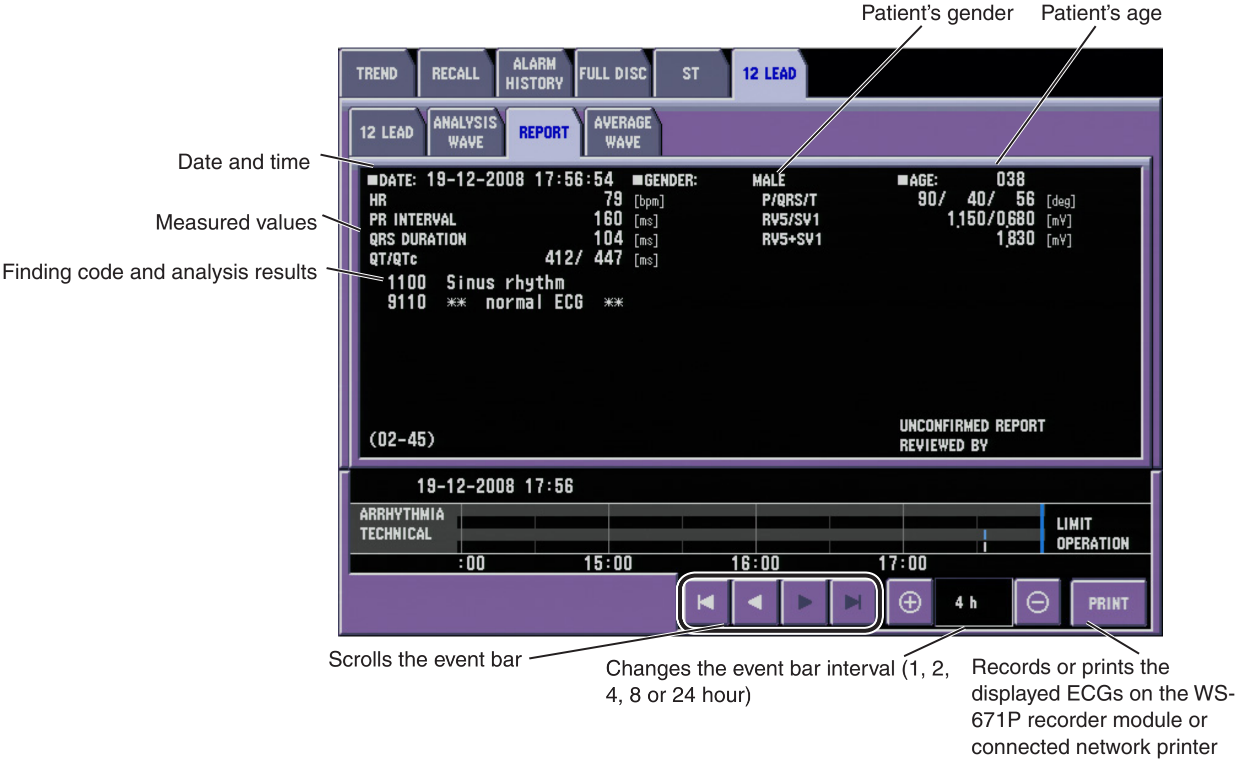
III 0.03 [mV] aVF 0.04 [mV] V3 0.35 [mV] V6 0.05 [mV]

RHYTHM[II]

19-12-2008 17:56

TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
12 LEAD
ANALYSIS WAVE
REPORT
AVERAGE WAVE
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
:00
15:00
16:00
17:00
4 h
PRINT
Patient's gender
Patient's age
Date and time
Lead
ST level
Analyzed ECG (about 2.5 s)
Rhythm waveform (about 10 s)
Event bar
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)
Records or prints the displayed ECGs on the WS-671P recorder module or connected network printer

To see the interpretation result, touch the REPORT tab.

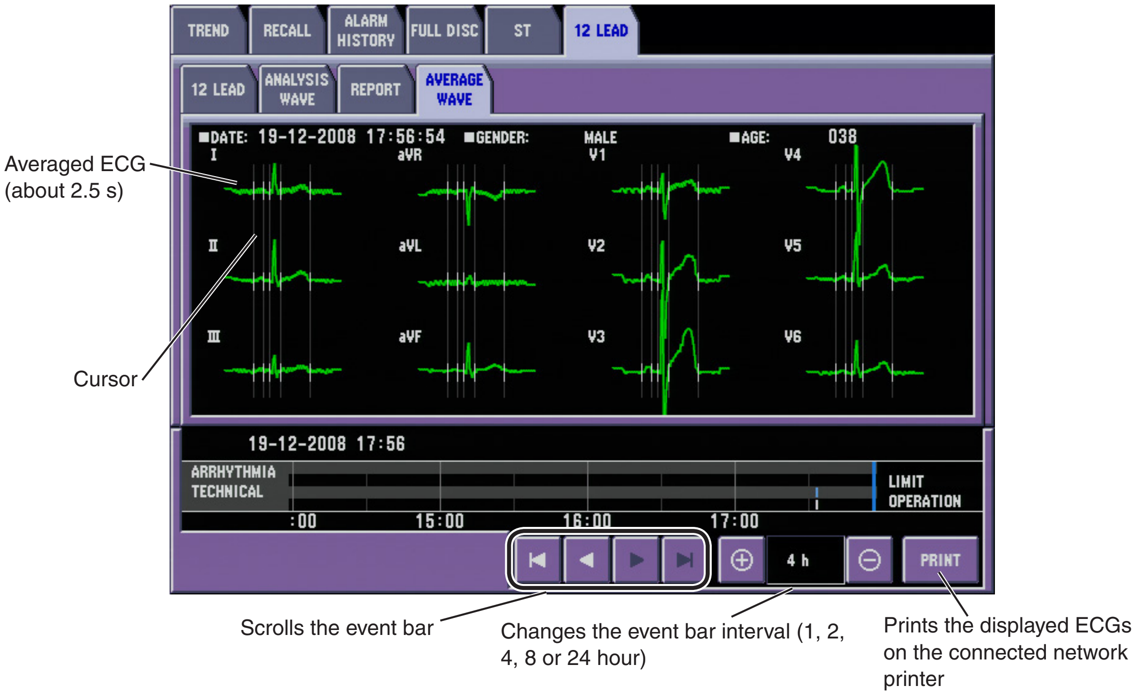


```
■DATE: 19-12-2008 17:56:54 ■GENDER:      MALE           ■AGE:     038
HR                      79 [bpm]          P/QRS/T          90/  40/  56 [deg]
PR INTERVAL            160 [ms]           RV5/SV1       1.150/0.680 [mV]
QRS DURATION           104 [ms]           RV5+SV1             1.830 [mV]
QT/QTc            412/ 447 [ms]
  1100  Sinus rhythm
  9110  **  normal ECG  **

(02-45)                                          UNCONFIRMED REPORT
                                                 REVIEWED BY
```

Patient's gender
Patient's age
Date and time
Measured values
Finding code and analysis results
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
12 LEAD
ANALYSIS WAVE
REPORT
AVERAGE WAVE
19-12-2008 17:56
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
:00
15:00
16:00
17:00
4 h
PRINT
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)
Records or prints the displayed ECGs on the WS-671P recorder module or connected network printer

To see the averaged ECGs, touch the AVERAGE WAVE tab. The cursors appear to indicate the P wave start and end points, QRS start and end points and T wave end points.



```
■DATE: 19-12-2008 17:56:54 ■GENDER:      MALE           ■AGE:     038
```

Averaged ECG (about 2.5 s)
Cursor
TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
12 LEAD
ANALYSIS WAVE
REPORT
AVERAGE WAVE
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
19-12-2008 17:56
ARRHYTHMIA
TECHNICAL
LIMIT
OPERATION
:00
15:00
16:00
17:00
4 h
PRINT
Scrolls the event bar
Changes the event bar interval (1, 2, 4, 8 or 24 hour)
Prints the displayed ECGs on the connected network printer

DRUG/LUNG FUNCTION Windows

DRUG Window

On the DRUG window, you can calculate the flow rates and dosages for medication titrations. The flow rate is calculated from the following equation. The dosage can also be calculated when the flow rate is known.

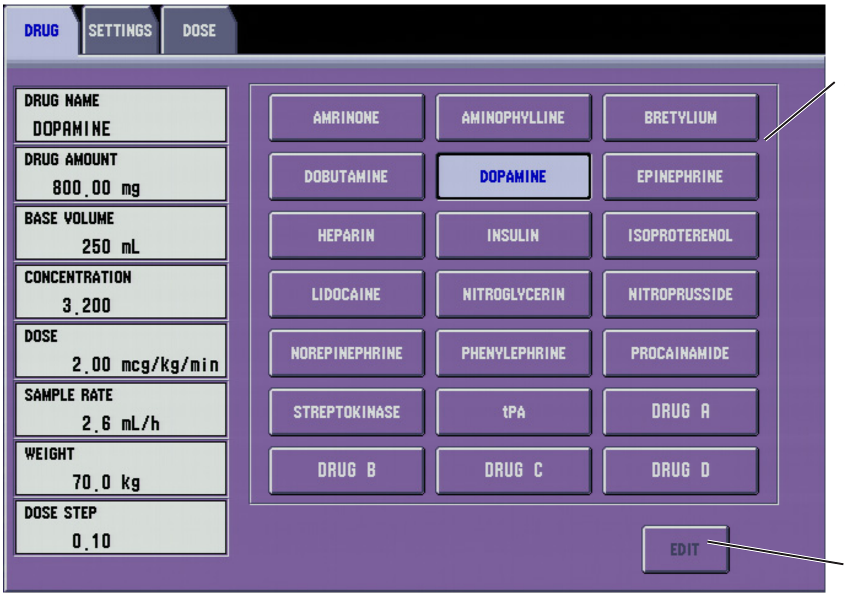
$$\text{Flow rate} = \frac{\text{Dosage} \times \text{Patient Weight} \times \text{Solution Amount}}{\text{Drug Amount}}$$

The DRUG window has the following windows.

- DRUG window for entering drug name, registering drugs and the units other than the factory default settings
- SETTINGS window for entering drug amount (AMOUNT), solution amount (VOLUME), dosage (DOSE), flow rate (SAMPLE RATE), patient weight and dose step
- DOSE window for displaying the table of the selected drug titration

NOTE:

- When using the DRUG window for the first time after shipment or after settings are initialized, you must set the drug names and other settings.
- When the patient weight is changed on the ADMIT window, the titration is automatically recalculated with the new weight.


DRUG
SETTINGS
DOSE
AMRINONE
AMINOPHYLLINE
BRETYLIUM
DOBUTAMINE
DOPAMINE
EPINEPHRINE
HEPARIN
INSULIN
ISOPROTERENOL
LIDOCAINE
NITROGLYCERIN
NITROPRUSSIDE
NOREPINEPHRINE
PHENYLEPHRINE
PROCAINAMIDE
STREPTOKINASE
tPA
DRUG A
DRUG B
DRUG C
DRUG D
EDIT

DRUG NAME
DOPAMINE

DRUG AMOUNT
800.00 mg

BASE VOLUME
250 mL

CONCENTRATION
3.200

DOSE
2.00 mcg/kg/min

SAMPLE RATE
2.6 mL/h

WEIGHT
70.0 kg

DOSE STEP
0.10

Select drug from here.

Displays EDIT window for entering drug name and dose unit

17 drugs and drug amount, solution amount, dosage and dose step for each drug are preset on the monitor. You can set four other drugs on the DRUG window and change the settings on the EDIT window. The following drug names are preset.

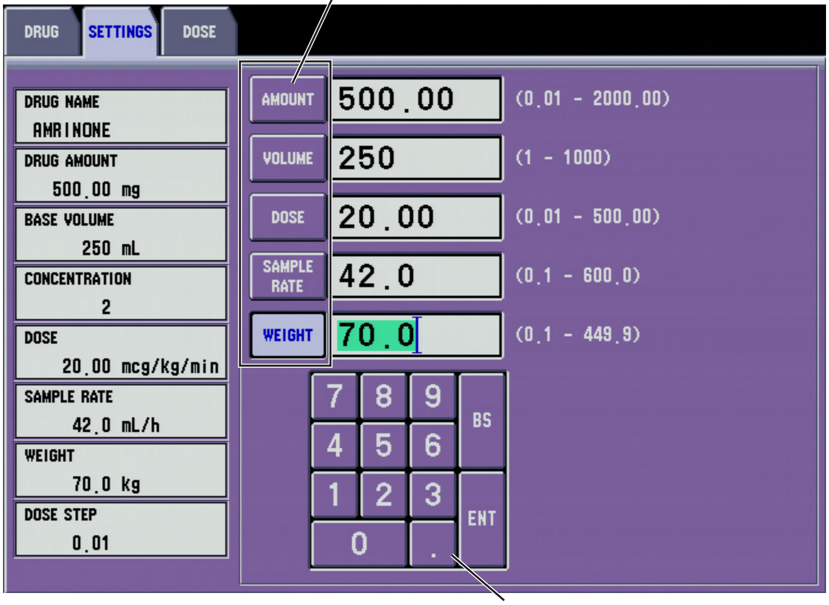
- Amrinone
- Aminophylline
- Bretylium
- Dobutamine
- Dopamine
- Epinephrine
- Heparin
- Insulin
- Isoproterenol
- Lidocaine
- Nitroglycerin
- Nitroprusside
- Norepinephrine
- Phenylephrine
- Procainamide
- Streptokinase
- tPA

Using Drug Calculation

1. Display the DRUG window.
   Press the [Menu] key → DRUG key.

2. On the DRUG window, select the drug name.

3. On the SETTINGS window, enter other necessary settings. For drugs which need patient weight to calculate the flow rate, enter the patient weight on the ADMIT window or the SETTINGS window of the DRUG window.



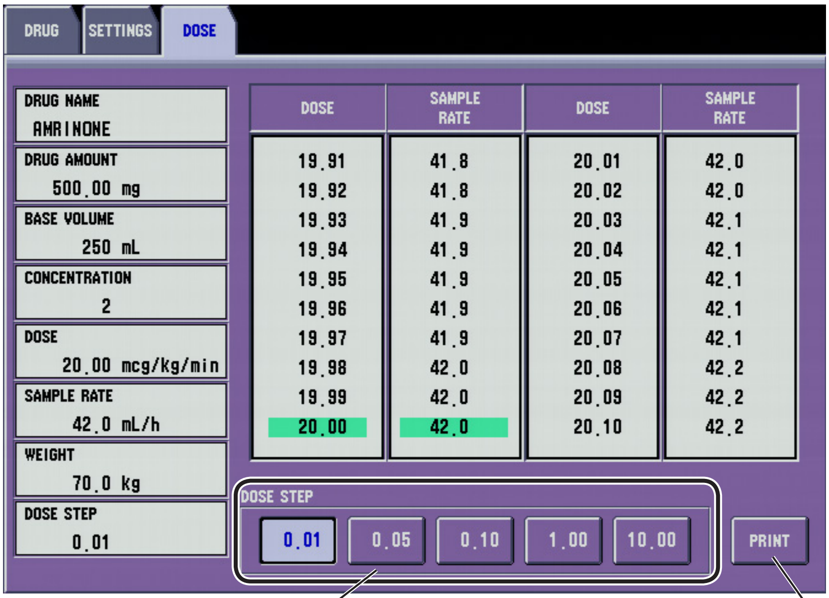
DRUG NAME	AMRINONE
DRUG AMOUNT	500.00 mg
BASE VOLUME	250 mL
CONCENTRATION	2
DOSE	20.00 mcg/kg/min
SAMPLE RATE	42.0 mL/h
WEIGHT	70.0 kg
DOSE STEP	0.01

AMOUNT	500.00	(0.01 - 2000.00)
VOLUME	250	(1 - 1000)
DOSE	20.00	(0.01 - 500.00)
SAMPLE RATE	42.0	(0.1 - 600.0)
WEIGHT	70.0	(0.1 - 449.9)

Touch key to enter value

Use the numeric keys to enter value. Touch the ENT key to register the entered value

4. Touch the DOSE tab to display the titration table. The titration values calculated from the settings on the SETTINGS window are displayed in the table.



DRUG NAME	AMRINONE
DRUG AMOUNT	500.00 mg
BASE VOLUME	250 mL
CONCENTRATION	2
DOSE	20.00 mcg/kg/min
SAMPLE RATE	42.0 mL/h
WEIGHT	70.0 kg
DOSE STEP	0.01

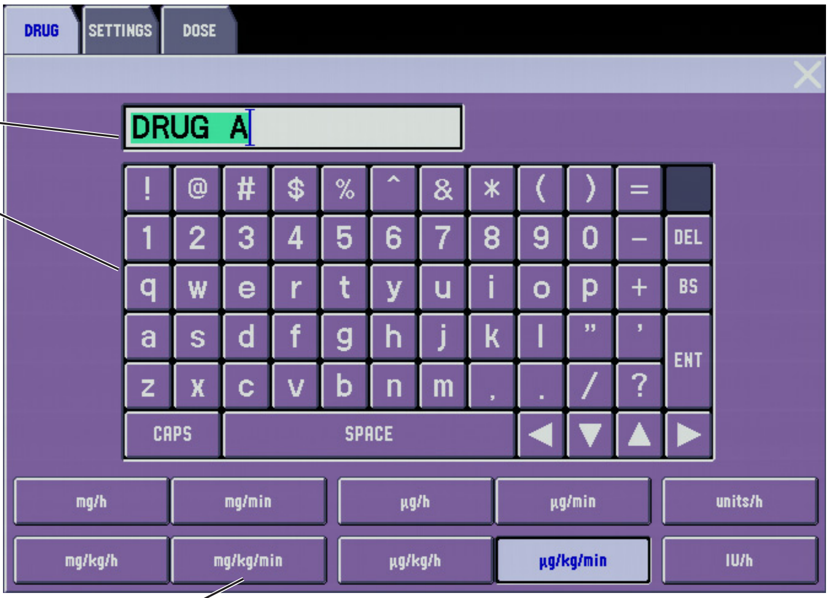
DOSE	SAMPLE RATE	DOSE	SAMPLE RATE
19.91	41.8	20.01	42.0
19.92	41.8	20.02	42.0
19.93	41.9	20.03	42.1
19.94	41.9	20.04	42.1
19.95	41.9	20.05	42.1
19.96	41.9	20.06	42.1
19.97	41.9	20.07	42.1
19.98	42.0	20.08	42.2
19.99	42.0	20.09	42.2
20.00	42.0	20.10	42.2

Select the dose step

Prints the displayed dose table and settings on the WS-671P recorder module or network printer

Registering Drugs

When using a drug other than the 17 preset drugs, assign a drug name and dose unit to Drug A, B, C or D on the DRUG window. When the dosage unit is set, the sample rate unit is automatically set.


DRUG
SETTINGS
DOSE
! @ # $ % ^ & * ( ) =
1 2 3 4 5 6 7 8 9 0 – DEL
q w e r t y u i o p + BS
a s d f g h j k l " ' ENT
z x c v b n m , . / ?
CAPS
SPACE
mg/h
mg/min
μg/h
μg/min
units/h
mg/kg/h
mg/kg/min
μg/kg/h
μg/kg/min
IU/h

DRUG A

Entered drug name

Use the keyboard to enter drag name

Select dose unit

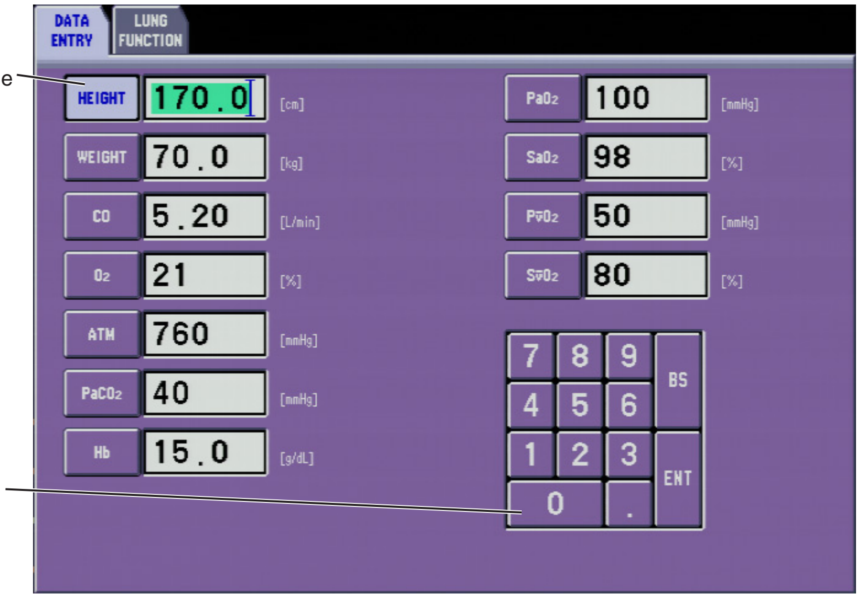
LUNG FUNCTION Window

There are two windows. The DATA ENTRY window calculates the patient's respiration dynamics and the LUNG FUNCTION window displays the calculation result. The following data required for this calculation is automatically acquired from the monitoring parameters when the window is opened.

- Patient's height and weight entered on the ADMIT window
- CCO value (When CCO is measured, the CCO value is used as the CO value)
- O_2 when O_2 or anesthetic gas is monitored

Calculating the LUNG FUNCTION

1. Display the DATA ENTRY window.
   Press the [Menu] key → LUNG FUNCTION key → DATA ENTRY tab.


DATA ENTRY
LUNG FUNCTION
7 8 9 BS
4 5 6
1 2 3 ENT
0 .

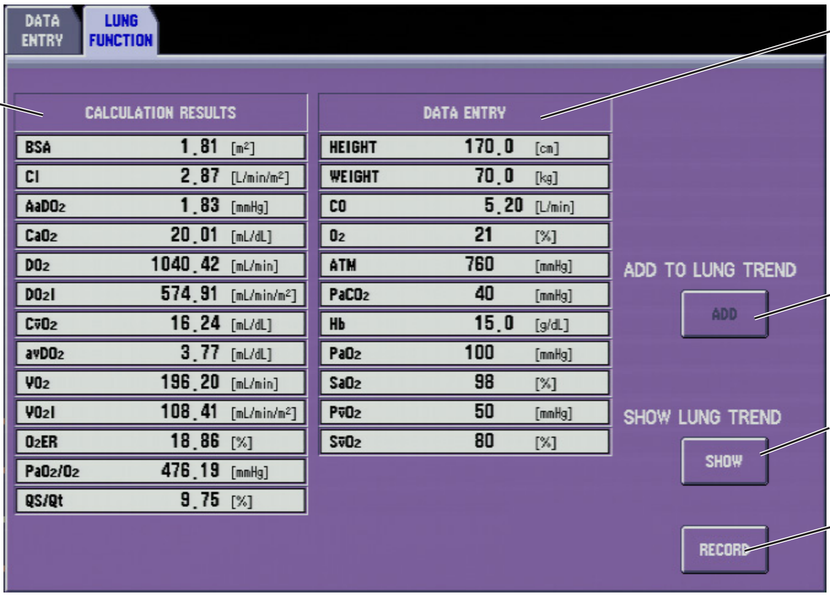
HEIGHT 170.0 [cm]
WEIGHT 70.0 [kg]
CO 5.20 [L/min]
O_2 21 [%]
ATM 760 [mmHg]
$PaCO_2$ 40 [mmHg]
Hb 15.0 [g/dL]
PaO_2 100 [mmHg]
SaO_2 98 [%]
$P\bar{v}O_2$ 50 [mmHg]
$S\bar{v}O_2$ 80 [%]

Touch key to enter value

Use the numeric keypad to change the values in the DATA ENTRY column on the LUNG FUNCTION window

2. If necessary, change values using the numeric keypad. When height or weight is changed, the same setting on the ADMIT window and windows which use height and weight are also changed. Touch ENT key to register the entered value. The respiration dynamics are recalculated according to the entered values.

3. Touch the LUNG FUNCTION tab to display the LUNG FUNCTION window.


DATA ENTRY
LUNG FUNCTION
ADD TO LUNG TREND
ADD
SHOW LUNG TREND
SHOW
RECORD

CALCULATION RESULTS		
BSA	1.81	[m²]
CI	2.87	[L/min/m²]
$AaDO_2$	1.83	[mmHg]
CaO_2	20.01	[mL/dL]
DO_2	1040.42	[mL/min]
DO_2I	574.91	[mL/min/m²]
$C\bar{v}O_2$	16.24	[mL/dL]
$avDO_2$	3.77	[mL/dL]
VO_2	196.20	[mL/min]
VO_2I	108.41	[mL/min/m²]
O_2ER	18.86	[%]
PaO_2/O_2	476.19	[mmHg]
QS/Qt	9.75	[%]

DATA ENTRY		
HEIGHT	170.0	[cm]
WEIGHT	70.0	[kg]
CO	5.20	[L/min]
O_2	21	[%]
ATM	760	[mmHg]
$PaCO_2$	40	[mmHg]
Hb	15.0	[g/dL]
PaO_2	100	[mmHg]
SaO_2	98	[%]
$P\bar{v}O_2$	50	[mmHg]
$S\bar{v}O_2$	80	[%]

The values in this column are automatically calculated according to the values in the DATA ENTRY column

The values in this column can be changed on the DATA ENTRY window

Adds the values on the window to the LUNG TREND page in the TREND window

Shows the LUNG TREND page in the TREND window

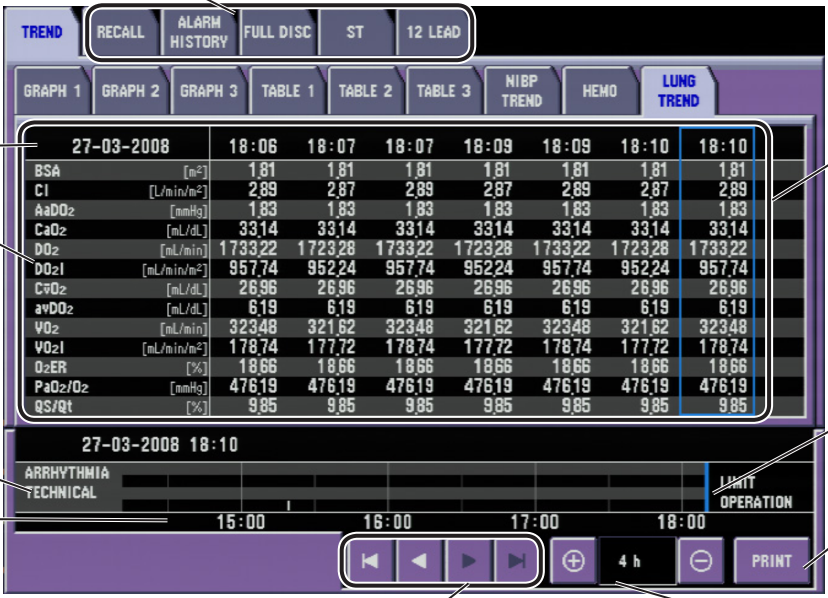
Records the displayed data on the WS-671P recorder module

4. Touch the ADD key to register the calculated values to the table in the LUNG TREND page in the TREND window.

Displaying the LUNG TREND Table

Touch the SHOW key on the LUNG FUNCTION window to display the table in the LUNG TREND page in the TREND window.

Display other review window


TREND
RECALL
ALARM HISTORY
FULL DISC
ST
12 LEAD
GRAPH 1
GRAPH 2
GRAPH 3
TABLE 1
TABLE 2
TABLE 3
NIBP TREND
HEMO
LUNG TREND
27-03-2008 18:10
ARRHYTHMIA
TECHNICAL
LIMIT OPERATION
15:00
16:00
17:00
18:00
4 h
PRINT

27-03-2008		18:06	18:07	18:07	18:09	18:09	18:10	18:10
BSA	[m²]	1.81	1.81	1.81	1.81	1.81	1.81	1.81
CI	[L/min/m²]	2.89	2.87	2.89	2.87	2.89	2.87	2.89
$AaDO_2$	[mmHg]	1.83	1.83	1.83	1.83	1.83	1.83	1.83
CaO_2	[mL/dL]	33.14	33.14	33.14	33.14	33.14	33.14	33.14
DO_2	[mL/min]	1733.22	1723.28	1733.22	1723.28	1733.22	1723.28	1733.22
DO_2I	[mL/min/m²]	957.74	952.24	957.74	952.24	957.74	952.24	957.74
$C\bar{v}O_2$	[mL/dL]	26.96	26.96	26.96	26.96	26.96	26.96	26.96
$avDO_2$	[mL/dL]	6.19	6.19	6.19	6.19	6.19	6.19	6.19
VO_2	[mL/min]	323.48	321.62	323.48	321.62	323.48	321.62	323.48
VO_2I	[mL/min/m²]	178.74	177.72	178.74	177.72	178.74	177.72	178.74
O_2ER	[%]	18.66	18.66	18.66	18.66	18.66	18.66	18.66
PaO_2/O_2	[mmHg]	476.19	476.19	476.19	476.19	476.19	476.19	476.19
QS/Qt	[%]	9.85	9.85	9.85	9.85	9.85	9.85	9.85

Date and time

Displays data from LUNG FUNCTION window

Event bar

Time

Selected file

Shows event occurrence of selected file

Records or prints the lung trend data of the selected time period on the WS-671P recorder module or connected network printer

Scrolls the event bar

Changes the event bar interval (1, 2, 4, 8 or 24 hour)

Recording

Recording can be performed on the optional WS-671P recorder module. When the bedside monitor has no recorder module but is connected to the central monitor network, recording can be performed on the central monitor recorder. When recording on the central monitor is available, the central monitor name appears in <RECORD ON CENTRAL MONITOR> box on the RECORD window of the SYSTEM SETUP window.

Recording Modes

There are three recording modes:

- Manual recording
  Real time/delayed waveform recording: Three waveforms selected on the RECORD window and vital signs data are recorded whenever the [Record] key on the bedside monitor is pressed.
  Recording on the review windows and analysis/calculation windows: The displayed data on the review/analysis/calculation window is recorded when the PRINT key on the review/analysis/calculation window is touched.
- Periodic recording
  Waveform recording: Three waveforms selected on the RECORD window and vital signs data are recorded automatically at the set interval.
  OCRG trendgraph recording: OCRG on the home screen can be recorded in 5 or 15 minute interval when OCRG is selected for <PERIODIC REC INTERVAL (min)>.
- Alarm recording
  When a vital sign alarm or arrhythmia alarm occurs, three waveforms selected on the RECORD window and vital signs data are automatically recorded.

  NOTE: Alarm recording is not performed when an alarm is suspended or <ALARM RECORDING> is set to OFF.

When More than One Recording Modes is Triggered

If another recording is triggered during recording, only the first recording is performed.

During alarm recording, if a higher alarm level alarm occurs, the current alarm recording period is extended for 20 seconds.

Changing Recording Settings

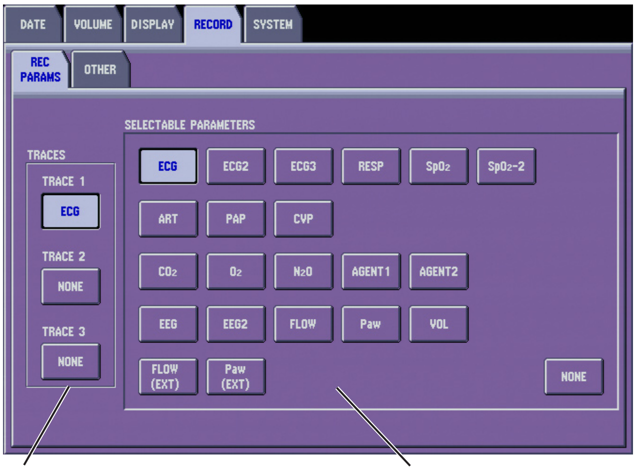
The following items can be set for recording.

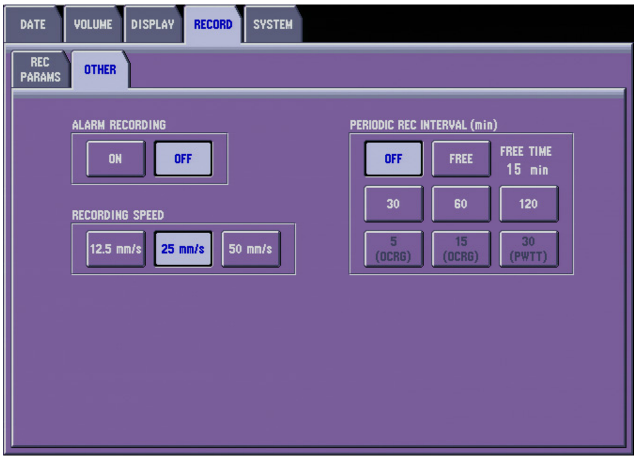
- Recording waveforms (up to three parameters)
- Recording speed for manual recording by the [Record] key on the bedside monitor
- Periodic recording interval/off
- Alarm recording on or off

The following items are set on the RECORD window of the SYSTEM SETUP window.

- Real time or 8 second delayed recording for manual recording (REAL TIME, DELAY)
- Recording period for manual recording (CONTINUOUS, 10 s, 20 s or 30 s)
- Interval for the FREE periodic recording (1 to 120 minutes)

Press the [Menu] key →RECORD key to display the RECORD window.


DATE
VOLUME
DISPLAY
RECORD
SYSTEM
REC PARAMS
OTHER
TRACES
TRACE 1
ECG
TRACE 2
NONE
TRACE 3
NONE
SELECTABLE PARAMETERS
ECG
ECG2
ECG3
RESP
SpO2
SpO2-2
ART
PAP
CVP
CO2
O2
N2O
AGENT1
AGENT2
EEG
EEG2
FLOW
Paw
VOL
FLOW (EXT)
Paw (EXT)
NONE


DATE
VOLUME
DISPLAY
RECORD
SYSTEM
REC PARAMS
OTHER
ALARM RECORDING
ON
OFF
RECORDING SPEED
12.5 mm/s
25 mm/s
50 mm/s
PERIODIC REC INTERVAL (min)
OFF
FREE
FREE TIME 15 min
30
60
120
5 (OCRG)
15 (OCRG)
30 (PWTT)

Select recording channel Select parameter

Selecting Recording Waveforms

The selected waveforms are recorded in manual recording by pressing the [Record] key, periodic recording and alarm recording. Up to three waveforms can be selected.

1. Select the channel in <TRACES> box on the REC PARAMS page.

2. Select the parameter in <SELECTABLE PARAMETERS> box on the OTHER page. Touch the NONE key when not using the channel.

Changing Recording Speed

Select 12.5 mm/s, 25 mm/s or 50 mm/s in <RECORDING SPEED> box on the OTHER page for manual recording.

Selecting Recording Interval for Periodic Recording

Select the recording interval in <PERIODIC REC INTERVAL> box. Select OFF when not performing periodic recording.

FREE

The interval for FREE is set on the RECORD window of the SYSTEM SETUP window which should be set by the administrator.

OCRG

When <CURRENT TREND> on the LAYOUT page of the DISPLAY window in the SYSTEM SETUP window is set to “OCRG 1 cm/min” or “OCRG 3 cm/min”, OCRG is recorded at the selected 5 minute or 15 minute interval in <PERIODIC REC INTERVAL> box.

PWTT

When <CURRENT TREND> on the LAYOUT page of the DISPLAY window in the SYSTEM SETUP window is set to “PWTT”, PWTT is recorded at the 30 minute interval.

Turning Alarm Recording On or Off

Set ON or OFF for <ALARM RECORDING> to automatically record waveforms and data at vital signs alarm and arrhythmia alarm occurrence.

INTERBED Window

When the bedside monitor is connected to a central monitor network, the bedside monitor data can be sent to the central monitor. The bedside monitor can display monitoring data of up to 16 other beds in the network on the INTERBED window. When an alarm occurs at an interbed bed, the “ALARM bed name” of the alarmed interbed appears on the home screen of this bedside monitor if you have previously registered the other bed as an interbed bed on the INTERBED window.

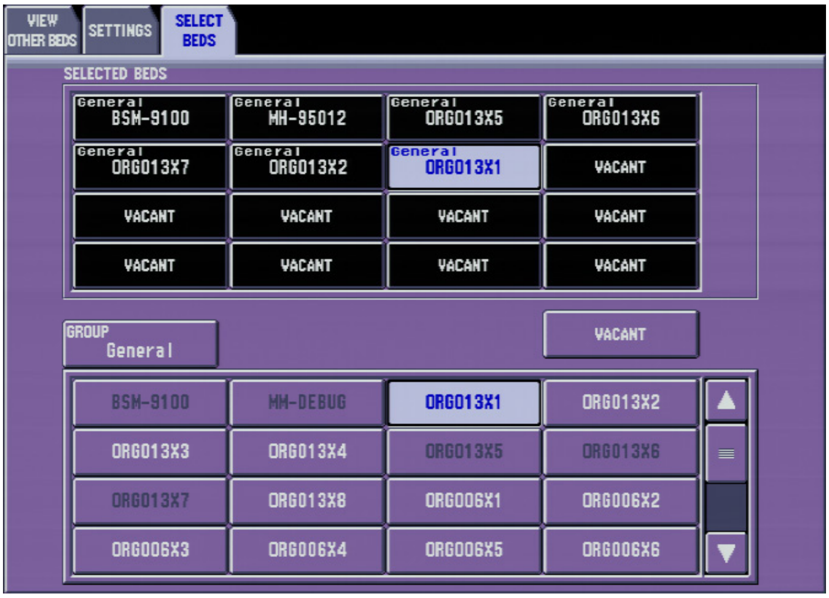
To use the interbed function, the following settings must be set.

- Register the beds to be managed by the interbed function on this monitor
- Set <INTERBED ALARM> on the SETTINGS window of the INTERBED window to ON
- Set <AUTO INTERBED DISPLAY> on the SETTINGS window of the INTERBED window to ON to automatically display the VIEW OTHER BEDS window when an alarm occurs on that bed

NOTE: The monitor must be connected to a network to use the interbed function.

Registering/Removing Interbed Beds

Up to 16 beds can be registered. Any bed in the monitor network can be registered as an interbed bed. When registering an interbed bed, the power of the bedside monitor to be registered must be turned on.

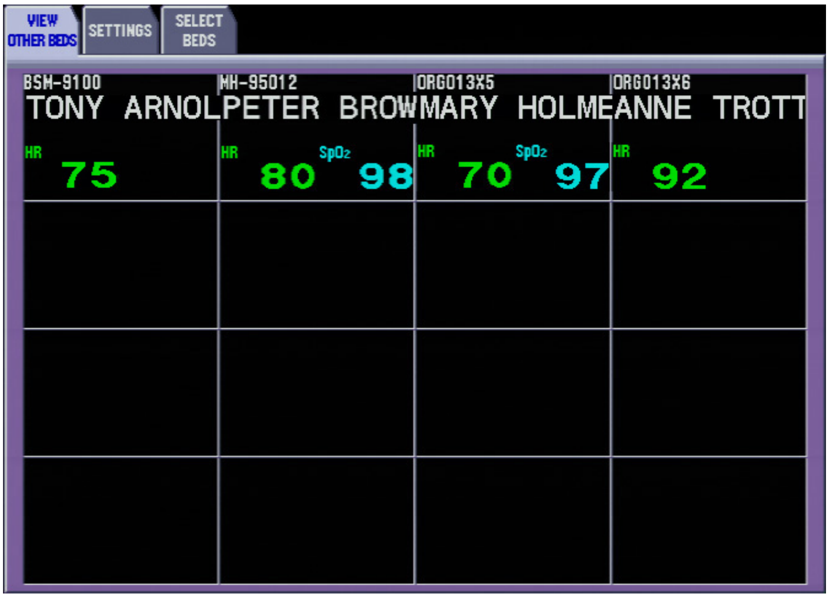

VIEW OTHER BEDS
SETTINGS
SELECT BEDS
SELECTED BEDS
General BSM-9100
General MH-95012
General ORG013X5
General ORG013X6
General ORG013X7
General ORG013X2
General ORG013X1
VACANT
GROUP General
VACANT
BSM-9100
MM-DEBUG
ORG013X1
ORG013X2
ORG013X3
ORG013X4
ORG013X5
ORG013X6
ORG013X7
ORG013X8
ORG006X1
ORG006X2
ORG006X3
ORG006X4
ORG006X5
ORG006X6

1. Display the SELECT BEDS window.
   Press the [Menu] key → INTERBED key → SELECT BEDS tab.
2. In <SELECTED BEDS> box, select the position to register the interbed bed.
3. Touch the GROUP key to select the group to which the desired bed belongs and select the bed from the bed list. The beds which are already registered as interbed beds cannot be selected.
4. Check that the selected bed appears in <SELECTED BEDS> box.

To remove a bed from the interbed beds, select the bed to be removed in <SELECTED BEDS> box and touch the VACANT key.

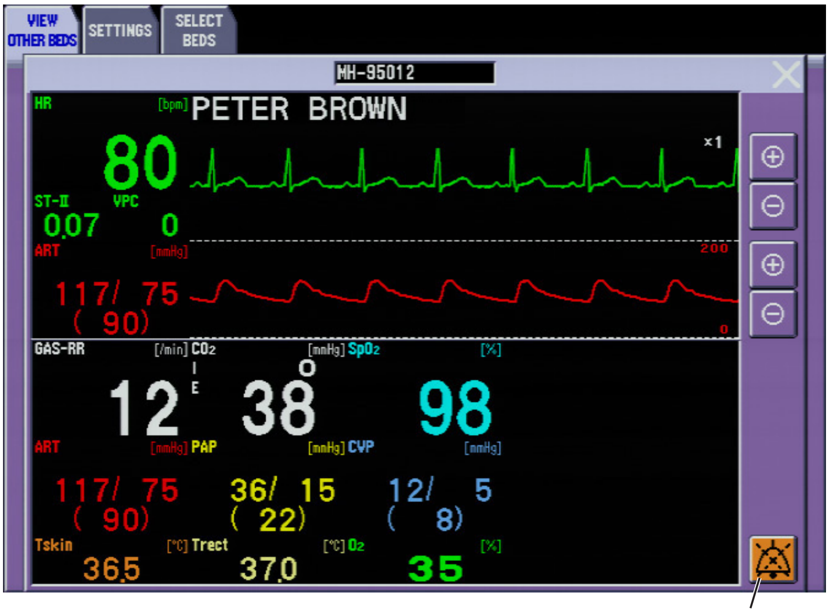
Displaying the Interbed Bed Data

Multiple Beds Window


VIEW OTHER BEDS
SETTINGS
SELECT BEDS
BSM-9100
TONY ARNOL
HR 75
MH-95012
PETER BROW
HR 80
SpO2 98
ORG013X5
MARY HOLME
HR 70
SpO2 97
ORG013X6
ANNE TROTT
HR 92

On the VIEW OTHER BEDS window, data for up to 16 interbed beds is displayed.
On the multiple beds window, heart rate and SpO_2 are displayed.

Individual Bed Window


VIEW OTHER BEDS
SETTINGS
SELECT BEDS
MH-95012
HR [bpm] PETER BROWN
80
×1
ST-II 0.07
VPC 0
ART [mmHg]
117/ 75
(90)
200
0
GAS-RR [/min] 12
CO2 [mmHg] I E 0 38
SpO2 [%] 98
ART [mmHg] 117/ 75 (90)
PAP [mmHg] 36/ 15 (22)
CVP [mmHg] 12/ 5 (8)
Tskin [°C] 36.5
Trect [°C] 37.0
O2 [%] 35
⊕
⊖
⊕
⊖

Silences the alarm on the alarmed interbed bed

Touch the desired bed to display the individual bed window. On the individual bed window, numeric data of monitoring parameters are displayed with ECG and another selected parameter waveform. You can change beds by selecting the bed on the multiple beds window.

To change the second waveform, touch the numeric data of the parameter you want to display. You can also change the waveform sensitivity or scale by using the ⊕ and ⊖ keys.
The parameters which can be displayed on the individual bed window are:
Heart rate, VPC, ST, respiration rate, CO_2, SpO_2, NIBP, temperature (2 channels), O_2 and IBP (3 channels)

Interbed Alarm

When an alarm occurs at an interbed bed, the alarm is indicated on this bedside monitor. The interbed alarm can be silenced from this bedside monitor. The alarm silence time depends on the setting on the alarmed bed. The interbed alarm can only be suspended on the alarmed bed.

To silence the interbed alarm, touch the Silence Alarm key (🔕) on the individual bed window. The alarm sound is also silenced and the alarm indicator turns off on the alarmed bed.

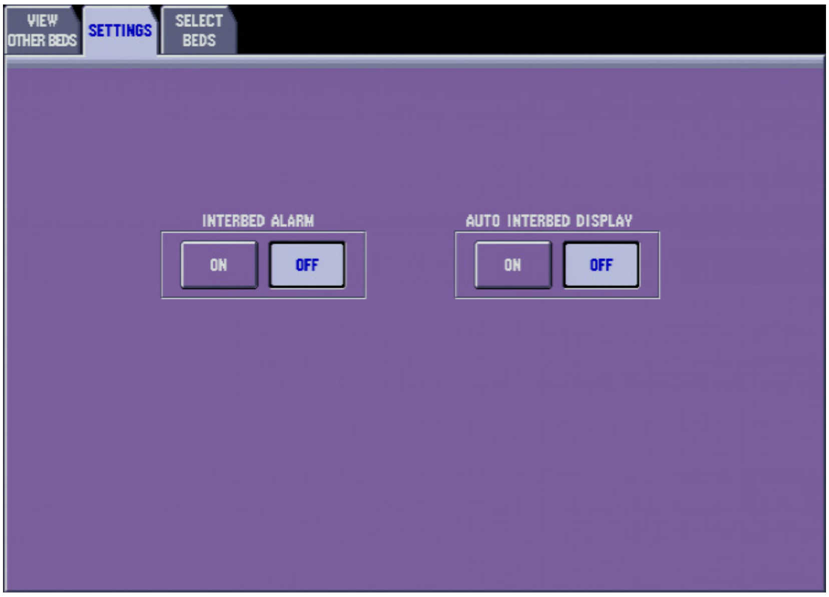
Settings Related to Interbed Alarm

CAUTION

The interbed window only appears on the home screen when an interbed alarm occurs and <AUTO INTERBED DISPLAY> is set to ON.

There are two settings related to interbed alarm monitoring: <INTERBED ALARM> ON or OFF and <AUTO INTERBED DISPLAY> ON or OFF.

Display the SETTINGS window of the INTERBED window to change settings.



INTERBED ALARM: ON [✓ OFF]

AUTO INTERBED DISPLAY: ON [✓ OFF]

Monitoring Parameters

Only the parameters which can be monitored by the basic configuration of the system are described in this manual.

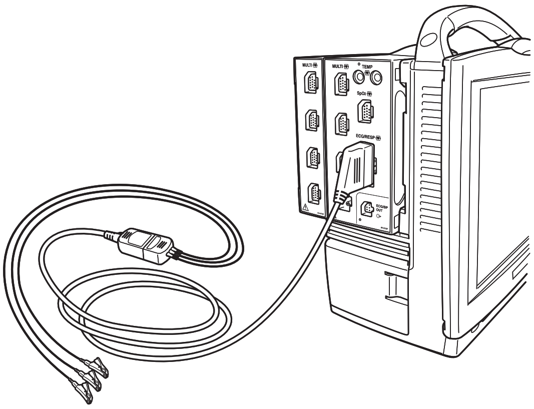
ECG

Preparation

The following electrodes and leads are available for ECG monitoring.

No. of Electrodes	Disposable Electrodes	Electrode Lead	ECG Connection Cord
3 (I, II, III)	Vitrode F-150M, F-150S, L-150, L-150X	BR-903P (IEC)/BR-903PA (AHA) (Clip type)	JC-906P (IEC)/ JC-906PA (AHA)
	Disposable Electrode with DIN type lead, Vitrode V-090M3, V-09IO3, V-120S3, N-03IS3		
6 (I, II, III, aVR, aVL, aVF, 2 from V1 to V6)	Vitrode F-150M, F-150S, L-150, L-150X	BR-906P (IEC)/BR-906PA (AHA) (Clip type)	
10 (I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)	Vitrode F-150M, F-150S, L-150, L-150X	ECG patient cable BJ-900P (IEC)/BJ-900PA (AHA)	
	Disposable Electrode with DIN type lead, Vitrode V-040M4, V-04IO4, V-060M6, V-06IO6		JC-900P (IEC)/ JC-900PA (AHA)

NOTE: The MULTI socket on the AY-660P input unit cannot be used for monitoring ECG using 10 electrodes.



Attach electrodes to the patient, connect the electrode lead to the electrodes and ECG connection cord, and connect the ECG connection cord to the ECG/RESP socket on the input unit.

To obtain a stable ECG:

- Shave excess hair.
- Rub the patient’s skin with a piece of cotton where the electrodes are to be attached.
- If the skin is dirty, clean with soap and water. Dry completely.
- Clean the patient’s skin with a piece of cotton moistened with alcohol. Dry completely.

WARNING

After attaching the electrode to the patient and connecting the cable to the monitor, check that electrodes are attached to the patient and check that the cable is connected to the monitor properly. When the electrodes are removed from the patient, do not touch the metal part of the electrode with bare hands or let the metal part of the electrode contact the metal part of the bed or any other conductive parts. Failure to follow this warning may cause electrical shock or injury to the patient by discharged energy.

WARNING

Do not use 12 lead ECG interpretation results and measured values from the Mason-Likar modification for diagnosis because the limb electrode placement is not the same as the standard 12 lead ECG. This may cause wrong diagnosis since 12 lead ECG interpretation of this monitor is based on the standard 12 lead ECG.

CAUTION

At the start of ECG monitoring, check that the dominant QRS is appropriate. Otherwise arrhythmia monitoring may be inaccurate.

CAUTION

- When using the electrodes with DIN type lead, use only Vitrode V or N electrodes. If other electrodes are used, the electrode lead might not be properly connected and ECG monitoring may be unstable.
- Do not use electrodes of different metals. ECG monitoring may be unstable if electrodes of different metals are used.

CAUTION

When the "CHECK ELECTRODES" message is displayed, ECG is not monitored properly and the ECG alarm does not function. Check the electrode, electrode leads and connection cord, and if necessary, replace with new ones.

WARNING

When using a defibrillator together with the monitor, use Ag/AgCl electrodes. Other types of electrodes, stainless steel in particular, will adversely affect the ECG waveform by slowing the baseline recovery on the monitor and result in no monitoring immediately following defibrillation.

CAUTION

Only use Nihon Kohden specified electrodes and electrode leads. When other type of electrodes or electrode leads are used, the "CHECK ELECTRODES" message may be displayed and ECG monitoring may stop.

CAUTION

When the "NOISE" or "CANNOT ANALYZE" message is displayed, ECG data and alarm are not reliable. Remove the cause by checking the electrodes, electrode leads, patient's body movement, EMG and peripheral instruments grounding. Also make sure that an electric blanket is not used.

NOTE: When a line isolation monitor is used, noise from the line isolation monitor may resemble actual ECG waveforms on the bedside monitor and cause false heart rate alarms or no alarm at all.

When using 3 electrodes, one lead can be monitored. When using 6 electrodes, 8 leads can be monitored. When using 10 electrodes, up to 12 leads can be monitored and 12 lead ECG interpretation can be analyzed. For details on the 12 lead interpretation, refer to the “12 LEAD ANALYSIS Window” in “12 LEAD/12 LEAD ANALYSIS Windows” section.

Use with an Electrosurgical Unit

For use with an electrosurgical unit (ESU), this monitor has a circuit to protect the patient from skin burn and to reduce ESU interference on the ECG waveform. However, the effectiveness of this circuit depends on electrode position and monitor setup. With an ESU, pay attention to the following points.

WARNING

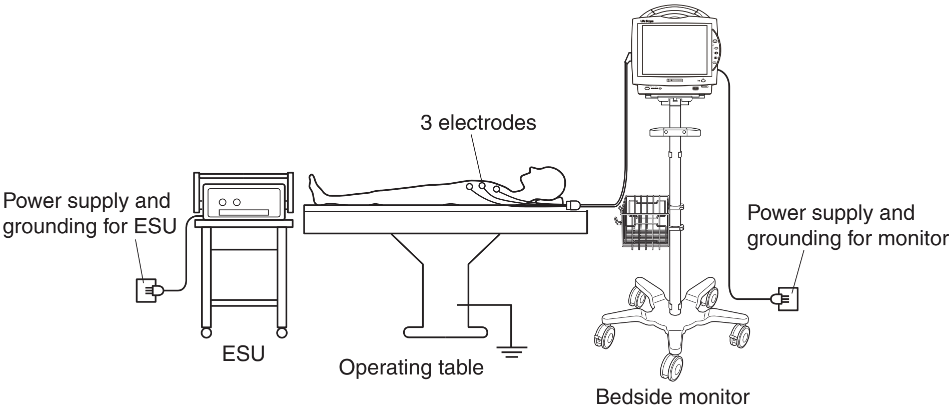
When the monitor is used with an electrosurgical unit (ESU), firmly attach the entire area of the ESU return plate. Otherwise, the current from the ESU flows into the electrodes of the monitor, causing electrical burn where the electrodes are attached. For details, refer to the ESU manual.

CAUTION

When using the monitor with an ESU, locate the monitor and ESU appropriately and ground instruments properly. Otherwise noise from the ESU may interfere with the ECG and the heart rate and arrhythmia analysis may be incorrect.

- Arrangement
  Install the monitor as far from the ESU as possible. If possible, locate them on opposite sides of the operating table.

- Power supply
  Noise from the ESU may interfere with the ECG signal through the AC power line. Supply power to the monitor and ESU from different outlets located as far from each other as possible. Do the equipotential grounding properly.


3 electrodes
Power supply and grounding for ESU
Power supply and grounding for monitor
ESU
Operating table
Bedside monitor

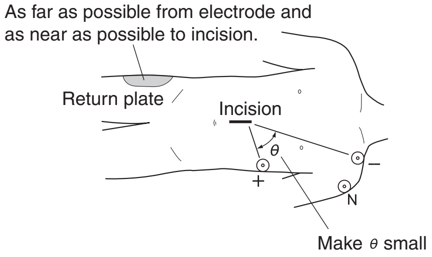
- Measure with 3-electrode lead
  Use the minimum number of electrodes. Use new electrodes.

- Minimize noise
  1. Select an ECG lead where the active ECG electrodes are located as far from the incision as possible.

  2. Position the + and – electrodes as close as possible.

3. Select the leads where the angle (θ) between the active electrodes and the incision is as small as possible.

4. Set the electrosurgical return plate as close to the incision as possible.


As far as possible from electrode and as near as possible to incision.
Return plate
Incision
θ
+
−
N
Make θ small

- Set the following items on the OTHER page of the ECG window.
  FILTERS: MAXIMUM
  SYNC SOURCE: SpO_2 or PRESS

- Monitor respiration by thermistor method or monitor CO_2
  Noise is superimposed on the waveform and the respiration rate cannot be monitored accurately in the impedance method. When monitoring respiration, turn respiration monitoring off or monitor the respiration by thermistor method or monitor CO_2.

Monitoring Arrhythmia

The following arrhythmias are monitored.

Arrhythmia name	Description
ASYSTOLE	Longer than 3 to 10 seconds (selectable) with no QRS complex.
VF	Ventricular fibrillation longer than 4 seconds.
VT	Ventricular tachycardia. 3 to 9 (selectable) or more consecutive VPCs when heart rate exceeding the VT heart rate limit (16 to 300 beats/min selectable).
EXT TACHY*[1]	Extreme tachycardia exceeding the EXTREME TACHY limit.
EXT BRADY*[1]	Extreme bradycardia dropping below the EXTREME BRADY limit.
VPC RUN	VPC short run. 3 to 8 (selectable) consecutive VPCs when heart rate exceeding the VPC RUN heart rate limit (16 to 300 beats/min selectable).
V BRADY*[1]	Ventricular bradycardia. 3 or more consecutive VPCs when heart rate dropping below V BRADY heart rate limit (15 to 299 beats/min selectable).
SV TACHY*[1]	Supraventricular tachycardia. 3 to 9 (selectable) or more consecutive normal QRS of regular R-R interval when heart rate exceeding the SV TACHY heart rate limit (16 to 300 beats/min selectable).
TACHYCARDIA	Heart rate above the upper heart rate limit.
BRADYCARDIA	Heart rate below the lower heart rate limit.
PAUSE*[1]	1 to 3 seconds (selectable) with no QRS.
COUPLET	VPC couplet (paired VPCs). 2 consecutive VPCs.
EARLY VPC	Early VPC including R-on-T type. VPC with a time interval from the preceding normal QRS complex of less than approximately one-third of the normal R-R interval, at heart rate dropping below 120*[2] beats/min.
MULTIFORM*[1]	Two different shaped VPCs within the last 3 minutes.
V RHYTHM*[1]	Ventricular rhythm. 3 or more consecutive VPCs.
BIGEMINY	Ventricular bigeminy. 3 or more consecutive pairs of VPC and normal QRS. A dominant rhythm of N-V-N-V-N-V (N = normal beat, V = ventricular beat)
TRIGEMINY*[1]	Ventricular trigeminy. A dominant rhythm of N-N-V-N-N-V.
FREQ VPC	Frequent VPCs. VPC rate (VPCs/min) reaching or exceeding the preset limit of 1 to 99 VPCs/min (selectable).
VPC	Ventricular premature contraction.
IRREGULAR RR*[1]	Consistently irregular R-R intervals.
PROLONGED RR*[1]	R-R interval 1.75 times longer than the dominant R-R interval.
NO PACER PULSE*[1]*[3]	No QRS and pacing pulse within the bradycardia limit. Oversensing.
PACER NON-CAPTURE*[1]*[3]	No QRS from the preceding pacing pulse for the preset time interval (40 to 480 ms selectable). Non-capture.

*1 These arrhythmias become available when “EXTENDED” is selected for <ARRHYTHMIA TYPE> on the SYSTEM SETUP window. The arrhythmia type setting is not available for the BSM-6000A series. For BSM-6000A series, arrhythmia type is STANDARD only.
*2 120 beats/min when <QRS DETECTION TYPE> is set to ADULT, 150 beats/min when <QRS DETECTION TYPE> is set to CHILD or NEONATE.
*3 Available only when pacing detection is set to On.

To monitor arrhythmia, <ARRHYTHMIA ANALYSIS> on the ARRHYTH ANALYSIS window must be set to ON.

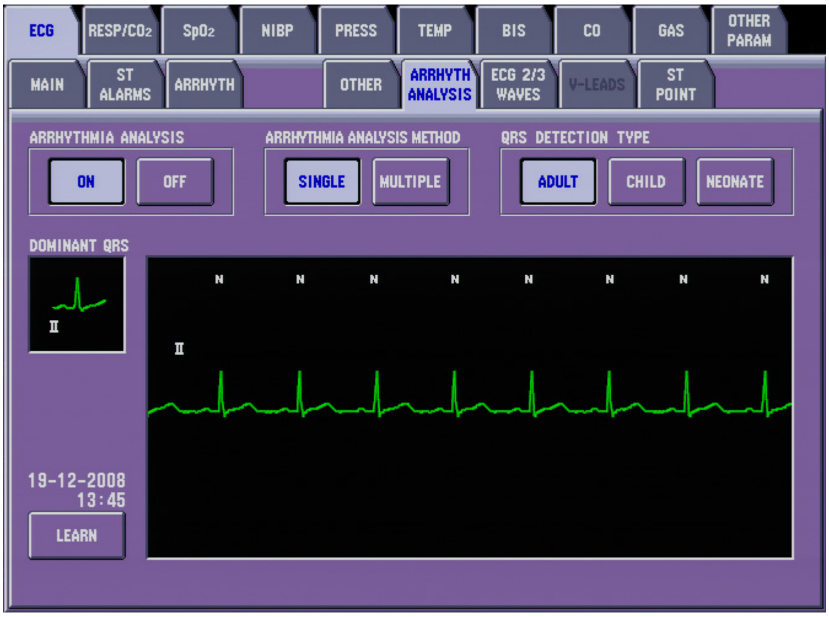
WARNING

For arrhythmia monitoring, set <ARRHYTHMIA ANALYSIS> on the ECG window to ON. Otherwise, there is no sound or indication for arrhythmia alarms (except for ASYSTOLE).

CAUTION

If there is any doubt about the arrhythmia analysis, make the monitor relearn the patient’s ECG and check that the dominant QRS is appropriate. Otherwise, an important arrhythmia may be overlooked.

Changing Arrhythmia Monitoring Settings


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
ARRHYTHMIA ANALYSIS
ON
OFF
ARRHYTHMIA ANALYSIS METHOD
SINGLE
MULTIPLE
QRS DETECTION TYPE
ADULT
CHILD
NEONATE
DOMINANT QRS
II
N
N
N
N
N
N
N
N
II
19-12-2008
13:45
LEARN

Turning Arrhythmia Analysis On or Off

Select ON or OFF in <ARRHYTHMIA ANALYSIS> box.

Selecting Arrhythmia Analysis Leads

Select SINGLE or MULTIPLE in <ARRHYTHMIA ANALYSIS METHOD> box to select the number of analyzing leads.
SINGLE: The lead selected for the first trace is analyzed.
MULTIPLE: The leads selected for the first and second traces are analyzed.

Selecting the Patient Type for QRS Detection

CAUTION

At the start of ECG monitoring, check that the correct patient type is set for <QRS DETECTION TYPE> on the ARRHYTH ANALYSIS page of the ECG window. If an inappropriate patient type is set, heart rate cannot be counted accurately and noise or P waves may be counted as QRS and cardiac arrest may be overlooked.

Select the monitoring patient type in the QRS DETECTION TYPE box. The selected patient type is displayed on the home screen. This setting returns to the master setting on the ARRHYTH page of the MASTER window when 30 minutes elapse after monitor power off.

The QRS settings depend to the patient type.

Items	QRS DETECTION TYPE Setting		
	ADULT	CHILD	NEONATE
Detect narrow QRS	Not available	Not available	Available
QRS detection sensitivity	Automatic sensitivity	Same as the <SENSITIVITY> setting	Automatic sensitivity
Default setting of ISO point	R – 80 ms	R – 56 ms	
Default setting of J point	R + 48 ms	Cannot be set	
Default setting of ST point	J + 60 ms	R + 60 ms	

Learning the ECG Waveform for Arrhythmia Detection

To learn ECG for arrhythmia detection, touch the LEARN key on the MAIN or ARRHYTH ANALYSIS page. The Dominant QRS is updated.

Checking the Dominant QRS

The dominant QRS and ECG of the selected first trace is displayed on the ARRHYTH ANALYSIS page. The monitor detects QRS of the monitoring ECG and classifies them into templates. The monitor selects the most typical QRS, called dominant QRS, and uses it for analyzing arrhythmia. Whenever ECG is learned or relearned, the dominant QRS is refreshed.

The ECG on ARRHYTH ANALYSIS window are annotated by the following QRS classification.

QRS Annotation	Description
N	Normal QRS complex
P	Paced QRS
V	Ventricular premature contraction
?	Impossible to classify or during learning.
–	Impossible to classify due to noise interference.

If there is any doubt about the arrhythmia analysis, make the monitor relearn the patient’s ECG and check the dominant QRS.

NOTE: The ECG waveform on the ECG window is delayed 5 seconds.

Changing ECG Settings

Change settings on the ECG window. The following settings can be changed for ECG monitoring.

- Monitoring lead and lead name
- ECG sensitivity
- Number of ECG traces on the home screen
- Learn ECG. Refer to the “Monitoring Arrhythmia” section.
- Heart rate, arrhythmia and ST alarm limits and setting
- Arrhythmia analysis on or off. Refer to the “Monitoring Arrhythmia” section.
- Arrhythmia analysis lead. Refer to the “Monitoring Arrhythmia” section.
- Check dominant QRS. Refer to the “Monitoring Arrhythmia” section.
- ST level settings
- Pacing setting
- Number of electrodes
- Auto lead change on or off when electrode is detached
- Heart rate display mode
- Filter mode
- Hum filter on or off
- Sync source
- Sync sound pitch
- Pulse rate display on or off
- QRS detection type

The following items can be set on the SYSTEM SETUP window.

- ECG electrode lead type (IEC or AHA)
- Heart rate sync sound pitch
- ECG display color
- Arrhythmia type (standard or extended)

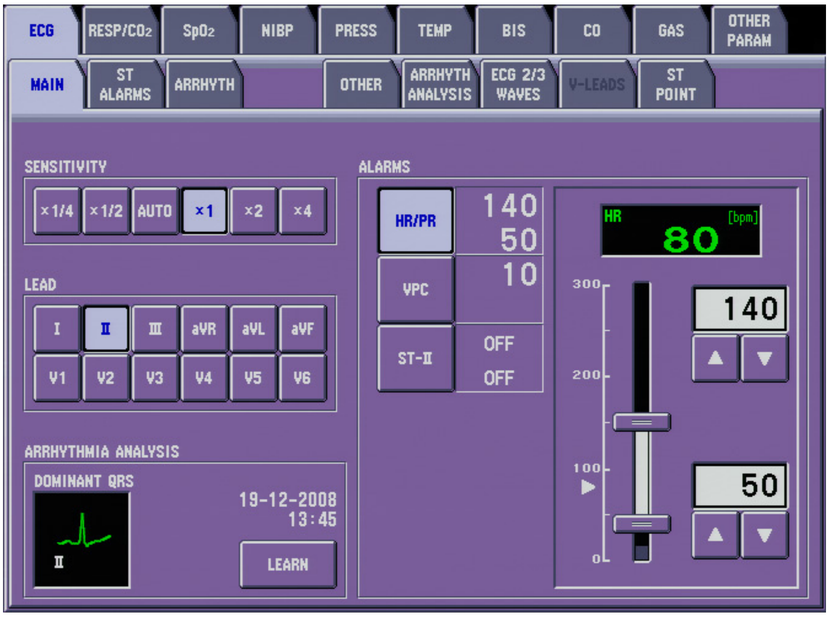
NOTE: The arrhythmia type setting is not available for the BSM-6000A series. For BSM-6000A series, arrhythmia type is STANDARD only.

The ST level unit (mV or mm) can be set on the SYSTEM CONFIGURATION screen.

The scale of the heart rate and ST level trendgraphs on the home screen are the same scale as the trendgraphs of the Review window.

The ECG sweep speed is the speed set for <SWEEP SPEED> on the WAVES page of the DISPLAY window.

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
SENSITIVITY
×1/4
×1/2
AUTO
×1
×2
×4
LEAD
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
ARRHYTHMIA ANALYSIS
DOMINANT QRS
II
19-12-2008
13:45
LEARN
ALARMS
HR/PR
140
50
VPC
10
ST-II
OFF
OFF
HR
[bpm]
80
300
200
100
0
140
50

<SENSITIVITY>: Select sensitivity for all monitoring ECG waves on the home screen.

<LEAD>: Select the lead for the selected trace on the home screen.

<ALARMS>

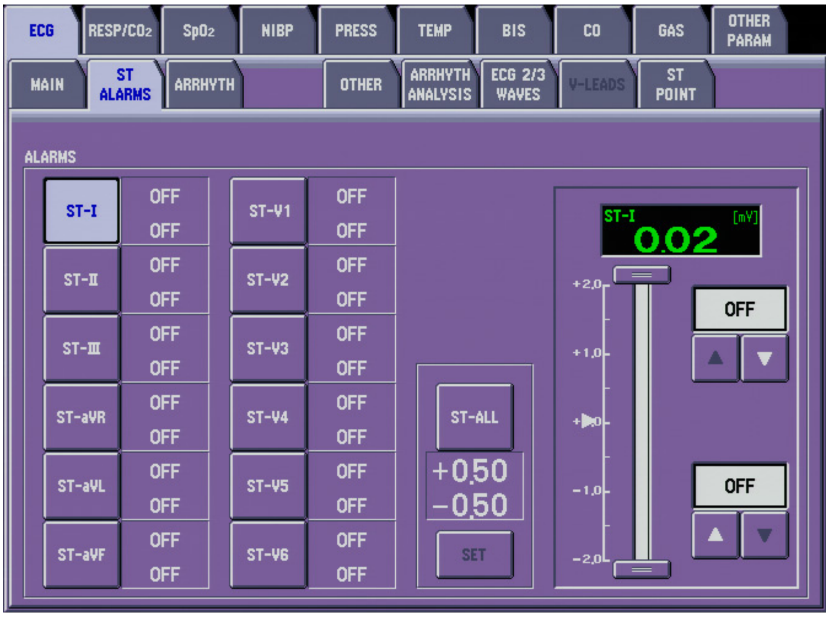
HR/PR alarm limits: Set the upper and lower heart rate or pulse rate alarm limits.

VPC alarm limit: Set the upper VPC alarm limit.

ST alarm limits: Set the upper and lower ST alarm limits of the first trace.

NOTE: VPC alarm limit can only be set when <ARRHYTHMIA ANALYSIS> on the ECG window is ON.

On the ST ALARMS Page

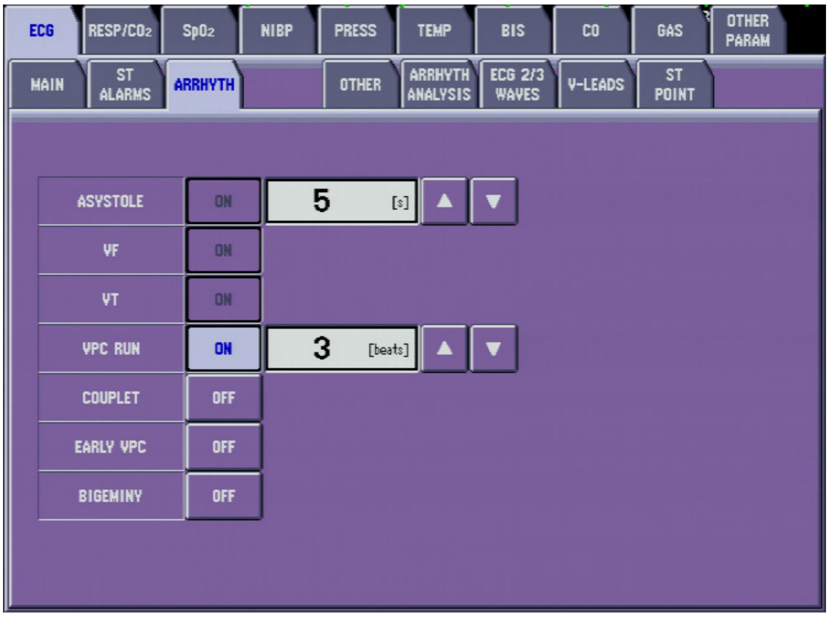

ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
ALARMS
ST-I
ST-II
ST-III
ST-aVR
ST-aVL
ST-aVF
ST-V1
ST-V2
ST-V3
ST-V4
ST-V5
ST-V6
OFF
ST-ALL
+0.50
−0.50
SET
ST-I
[mV]
0.02
+2.0
+1.0
0
−1.0
−2.0
OFF
OFF

<ALARMS>: Set the upper and lower ST alarm limits for each lead individually or all leads together. Touch the ST-ALL key to set all the alarm limits together for all leads. ST-ALL is based on the current measurement value.

On the ARRHYTH Page

> **WARNING**
>
> For arrhythmia monitoring, set <ARRHYTHMIA ANALYSIS> on the ECG window to ON. Otherwise, there is no sound or indication for arrhythmia alarms (except for ASYSTOLE).

> **CAUTION**
>
> When the alarm is turned OFF for an arrhythmia, there will be no alarm for that arrhythmia type. There is no message or mark to indicate that a certain arrhythmia alarm is turned off. Therefore, be careful when you turn off an arrhythmia alarm.



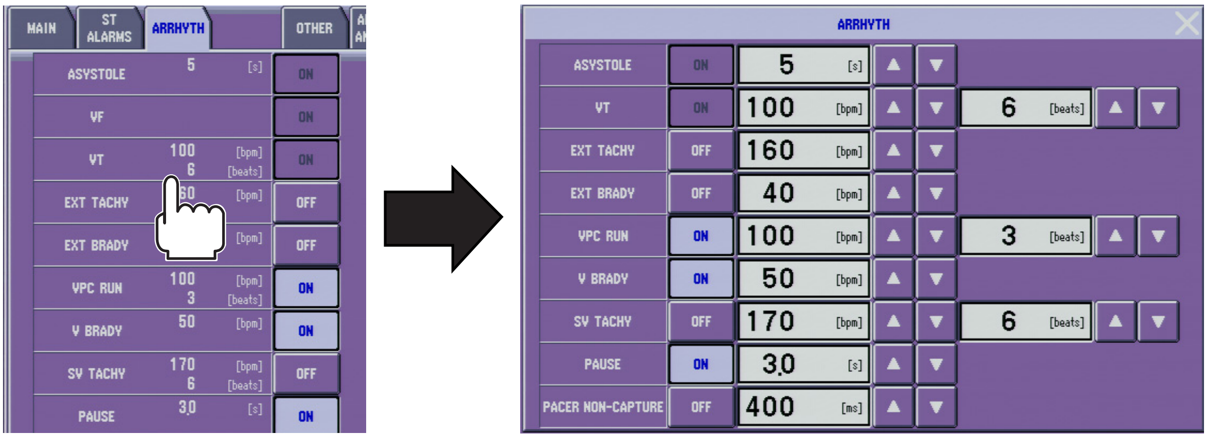
ASYSTOLE	ON	5	[s]
VF	ON		
VT	ON		
VPC RUN	ON	3	[beats]
COUPLET	OFF		
EARLY VPC	OFF		
BIGEMINY	OFF		

Turn the alarm for individual arrhythmias ON or OFF and set the threshold for some arrhythmias.

NOTE: For BSM-6000A series, items can be turned on or off but thresholds are fixed and cannot be changed. The thresholds are set by the administrator on the MASTER window of the SYSTEM SETUP window.

When EXTENDED is selected for the <ARRHYTHMIA TYPE> on the ECG page of the PARAMETERS window in the SYSTEM SETUP window, touch the threshold to display the ARRHYTH window and adjust the setting.

NOTE: The arrhythmia type setting is not available on the BSM-6000A series. For BSM-6000A series, arrhythmia type is STANDARD only.

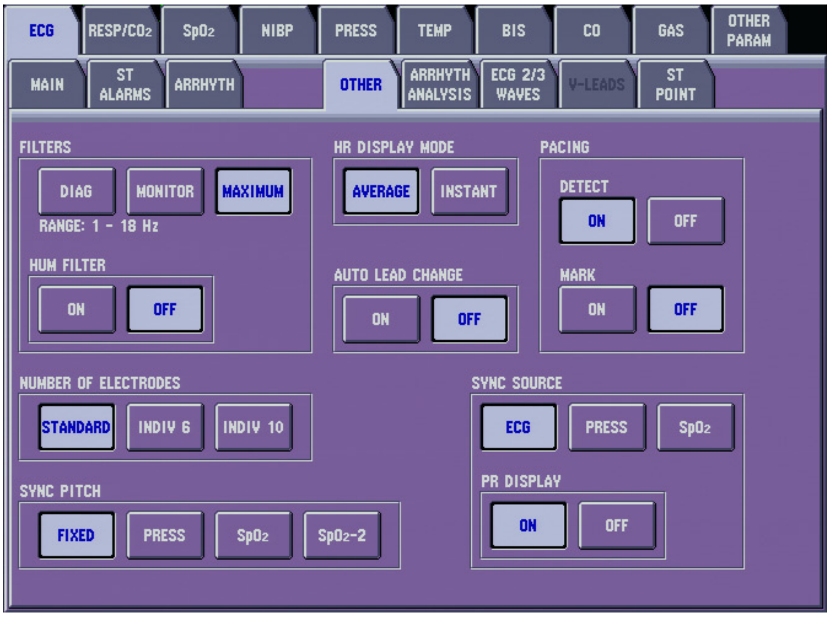


ASYSTOLE	5	[s]	ON
VF			ON
VT	100 6	[bpm] [beats]	ON
EXT TACHY	60	[bpm]	OFF
EXT BRADY		[bpm]	OFF
VPC RUN	100 3	[bpm] [beats]	ON
V BRADY	50	[bpm]	ON
SV TACHY	170 6	[bpm] [beats]	OFF
PAUSE	3.0	[s]	ON

ARRHYTH

ASYSTOLE	ON	5	[s]		
VT	ON	100	[bpm]	6	[beats]
EXT TACHY	OFF	160	[bpm]		
EXT BRADY	OFF	40	[bpm]		
VPC RUN	ON	100	[bpm]	3	[beats]
V BRADY	ON	50	[bpm]		
SV TACHY	OFF	170	[bpm]	6	[beats]
PAUSE	ON	3.0	[s]		
PACER NON-CAPTURE	OFF	400	[ms]		

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
FILTERS
DIAG
MONITOR
MAXIMUM
RANGE: 1 - 18 Hz
HUM FILTER
ON
OFF
HR DISPLAY MODE
AVERAGE
INSTANT
AUTO LEAD CHANGE
ON
OFF
PACING
DETECT
ON
OFF
MARK
ON
OFF
NUMBER OF ELECTRODES
STANDARD
INDIV 6
INDIV 10
SYNC SOURCE
ECG
PRESS
SpO2
SYNC PITCH
FIXED
PRESS
SpO2
SpO2-2
PR DISPLAY
ON
OFF

<FILTERS>: Select the filter type.

DIAG: No filter. This mode is best for viewing the details of the waveform. It is similar to the real ECG. (0.05 to 150 Hz)

MONITOR: Low-cut and high-cut filter. (0.3 to 40 Hz)

MAXIMUM: Baseline drift-free, hum (AC) and high-cut filter. Appropriate when there is noise from AC or ESU. (1 to 18 Hz)

NOTE:

- When performing defibrillation, set the <FILTERS> to MONITOR or MAXIMUM. The waveform recovery may become slow due to electrode polarization when DIAG is set.
- When sending data using a ZS-900P transmitter, the waveform data is limited to the following frequency response depending on the filter setting. For the frequency response of the BSM-6000 series bedside monitor, refer to the "Specifications" section.
  DIAG mode: 0.05 to 60 Hz
  MONITOR/MAXIMUM mode : 0.3 to 60 Hz
  The waveform may be distorted or the "CHECK ELECTRODES" message may be displayed on the receiving monitor when the waveform amplitude exceeds ± 5 mV.

<HUM FILTER>: Turn the hum filter on or off.

<HR DISPLAY MODE>: Select the mode for updating the heart rate.

AVERAGE: The heart rate is calculated by a moving average. The monitor detects 12 consecutive beats including VPC, averages the R-R intervals of the latest 12 beats and uses this average to calculate the current heart rate. When a new beat is detected, the heart rate is recalculated using the latest 12 beats. The heart rate display is updated every 3 seconds.

INSTANT: The heart rate is calculated every beat. The heart rate display is updated every 3 seconds.

<PACING>

WARNING

Turn the pacing pulse detection* to ON when monitoring a pacemaker patient. Otherwise the pacemaker pulse is not rejected. However, even when the pacing pulse detection is set to ON, the pacemaker pulse might not be rejected. When the pacemaker pulse is not rejected, the pacemaker pulse is detected as QRS and false heart rate may be indicated or critical arrhythmia such as asystole may be overlooked. Keep pacemaker patients under close observation.

WARNING

Even when the pacing pulse detection is set to ON, the pacemaker pulse can be overlooked or detected as QRS. You cannot confirm the pacemaker operation only from the detected pacemaker pulse.

* For the pacemaker pulse rejection capability of BSM-6000 series bedside monitor, refer to the "Specifications - ECG" section.

NOTE: When you monitor a premature baby or infant and the monitor miscounts the narrow width QRS, set this to OFF.

<DETECT>: Select ON when detecting pacing pulse.

<MARK>: Select ON to display pacing mark on the ECG waveform.
The pacing mark display position (above wave or overlap wave) on the ECG waveform can be selected on the PARAMETERS window of the SYSTEM SETUP window.

<AUTO LEAD CHANGE>: When monitoring with 6 or 10 electrodes and when this item is set to ON, the lead for the first trace on the home screen can be automatically changed to a stable lead when there is an electrode detachment or the "CHECK ELECTRODES" message is displayed for more than 5 seconds on the screen.

<NUMBER OF ELECTRODES>: Select the type and number of electrodes.
STANDARD: Any electrodes other than DIN type. The number of electrodes (3, 6 or 10) is automatically recognized by the monitor.
INDIV 6: Monitoring with 3 or 6 DIN type electrodes.
INDIV 10: Monitoring with more than 10 DIN type electrodes. The RF/RL electrode must be attached.

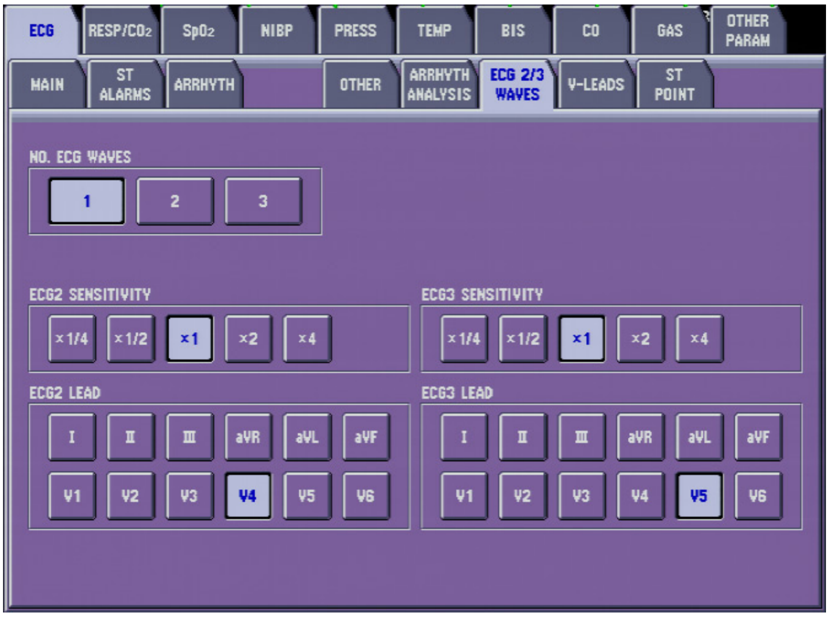
<SYNC SOURCE>: Select the sync sound source from ECG (heart rate), arterial blood pressure (IBP) and SpO_2.

NOTE:
- When heart rate is unstable because of an ESU, select SpO_2 or PRESS.
- When the connection cord of SpO_2 or IBP of the arterial blood pressure is disconnected from the monitor and an alarm occurs when the sync source is set to SpO_2 or PRESS, the sync source changes to ECG when the alarm is silenced by pressing the [Silence Alarms] key. The sync source returns to SpO_2 or PRESS when the SpO_2 or IBP is monitored again. When using IBP as the sync source, adjust zero balance.
- When the sensor is detached from the patient and alarm occurs, and the sync source is set to SpO_2 or PRESS, the sync source does not change to ECG when the alarm is silenced, and "- - -" is displayed for PR.
- The SpO_2-2 cannot be set to the sync sound source.

<PR DISPLAY>: Select the pulse rate display on or off. This setting is only available when <SYNC SOURCE> is set to ECG.

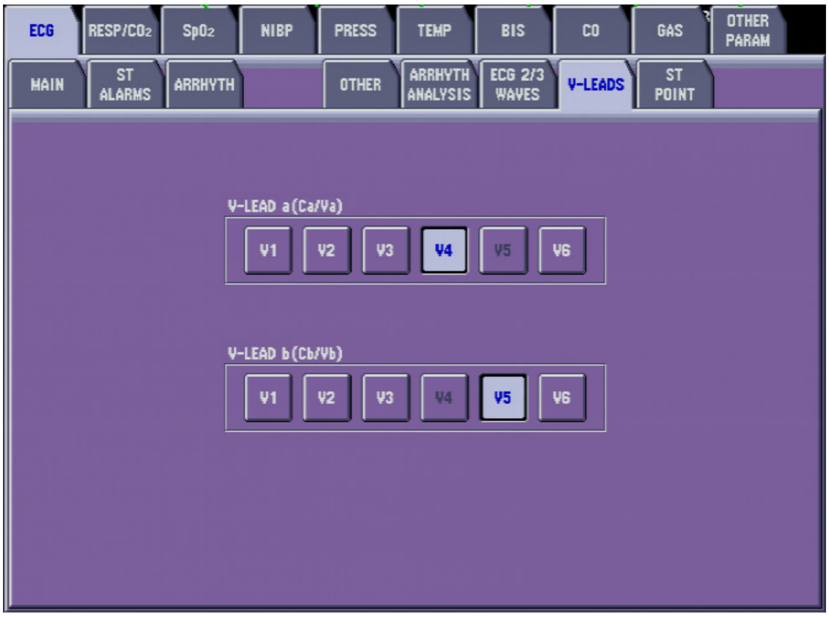
<SYNC PITCH>: Select the sync sound pitch.
FIXED: The pitch is fixed to the pitch selected on the SYSTEM SETUP window.
PRESS: The pitch is high when the BP value is above 120 mmHg. The pitch is low when the BP value is below 20 mmHg. The pitch changes in 20 steps from high to low for each 5 mmHg change between 120 and 20 mmHg BP value. The BP value of the highest priority arterial blood pressure is used.
SpO_2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2 connected to the SpO_2 socket.
SpO_2-2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2-2 connected to the MULTI socket. SpO_2-2 is only available for the AY-661P, AY-663P, AY-671P or AY-673P input unit.

On the ECG 2/3 WAVES Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
NO. ECG WAVES
1
2
3
ECG2 SENSITIVITY
×1/4
×1/2
×1
×2
×4
ECG3 SENSITIVITY
×1/4
×1/2
×1
×2
×4
ECG2 LEAD
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
ECG3 LEAD
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6

<NO. ECG WAVES>: Select 1, 2, or 3 to change the number of ECG waveforms.
<ECG2 SENSITIVITY>: Select sensitivity for the second trace on the home screen.
<ECG3 SENSITIVITY>: Select sensitivity for the third trace on the home screen.
<ECG2 LEAD>: Select the lead for the second trace on the home screen.
<ECG3 LEAD>: Select the lead for the third trace on the home screen.

On the V-LEADS Page

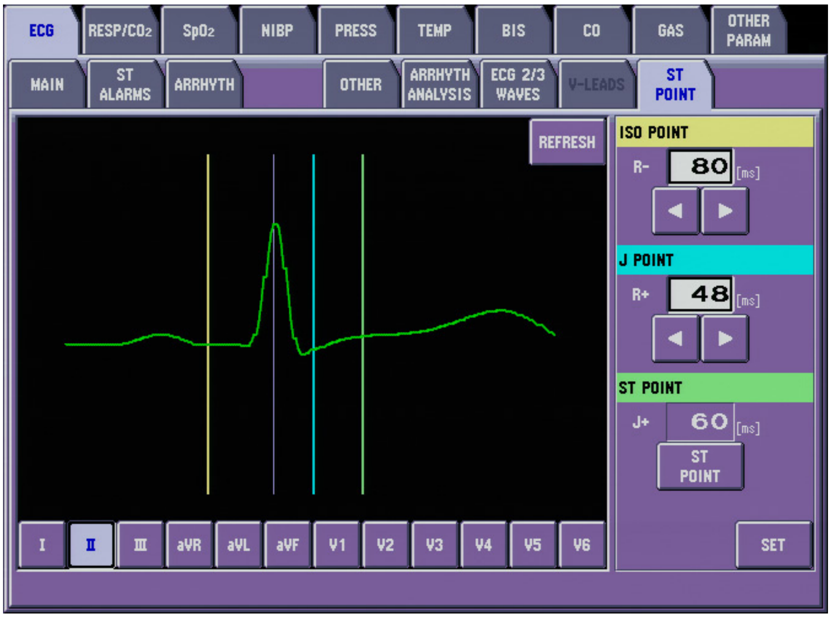

ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
V-LEAD a(Ca/Va)
V1
V2
V3
V4
V5
V6
V-LEAD b(Cb/Vb)
V1
V2
V3
V4
V5
V6

When monitoring with 6 electrodes, you can assign the leads for Va and Vb. After assigning the Va and Vb leads, select the monitoring lead.

On the ST POINT Page

Set the ISO point, J point and ST point for ST level measurement.

NOTE: Although the ST algorithm has been tested for accuracy of the ST analysis result, the significance of the ST level changes need to be determined only by a physician.


ISO POINT
R- 80 [ms]
J POINT
R+ 48 [ms]
ST POINT
J+ 60 [ms]

ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
ST ALARMS
ARRHYTH
OTHER
ARRHYTH ANALYSIS
ECG 2/3 WAVES
V-LEADS
ST POINT
REFRESH
ST POINT
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
SET

Select the lead(s) from the LEAD box to be displayed on the ST POINT page. The QRS wave(s) of the selected lead(s) appears on the page.

Touch the vertical cursor left or right for each point. Use the ◀ or ▶ key to adjust the vertical cursor left or right for each point.

To change the ST point, touch the ST POINT key.

To register the ST level measurement condition settings, touch the SET key.

Respiration

WARNING

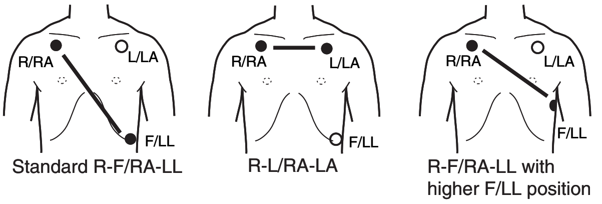
Interaction Between Minute Ventilation Rate-Adaptive Pacemakers and Cardiac Monitoring and Diagnostic Equipment*

The bioelectric impedance measurement sensor of a minute ventilation rate-adaptive implantable pacemaker may be affected by cardiac monitoring and diagnostic equipment which is connected to the same patient. If this occurs, the pacemaker may pace at its maximum rate and give incorrect data to the monitor or diagnostic equipment. In this case, set the IMP RESP MEASURE on the RESP/CO_2 window to OFF on the bedside monitor. For a patient that requires the respiration monitoring, measure the respiration by thermistor method.

* Minute ventilation is sensed in rate-adaptive pacemakers by a technology known as bioelectric impedance measurement (BIM). Many medical devices in addition to pacemakers use this technology. When one of these devices is used on a patient with an active, minute ventilation rate-adaptive pacemaker, the pacemaker may erroneously interpret the mixture of BIM signals created in the patient, resulting in an elevated pacing rate. For more information, see the FDA web site. http://www.fda.gov/cdrh/safety.html

Preparation

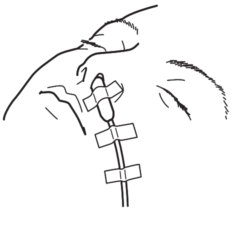
Electrode lead and position



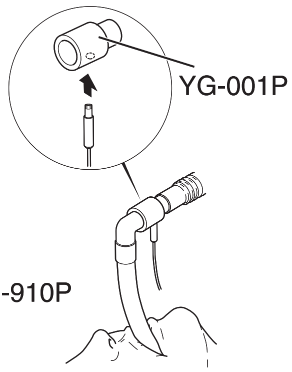
Standard R-F/RA-LL

R-L/RA-LA

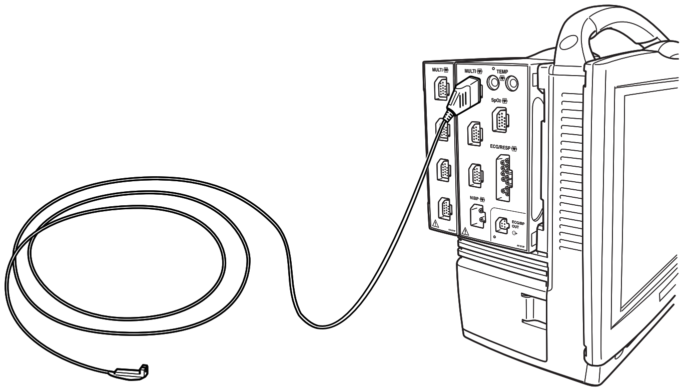
R-F/RA-LL with higher F/LL position



TR-900P



TR-910P



When connecting the TR-900P respiration pickup

Impedance method: Attach electrodes to the patient and connect the ECG connection cord to the ECG/RESP socket on the input unit. Attach R and F (RA and LL) or R and L (RA and LA) with the lungs between the electrodes.

Thermistor method: Attach the respiration pickup to the patient and connect the respiration pickup to the MULTI socket on the input unit or smart expansion unit.

NOTE: The MULTI socket on the AY-660P input unit cannot be used for monitoring respiration in thermistor method.

The following respiration pickups are available.

TR-900P* respiration pickup for nose

TR-910P respiration pickup for airway. YG-001P airway adapter is required.

* This part has not been checked for compliance with the MDD (Medical Device Directive). For EC member countries, Nihon Kohden recommends the use of parts that comply with MDD.

NOTE: Increase in the temperature of the inspired air during monitoring in thermistor method causes decrease in the temperature difference between inspiration and expiration, and the amplitude of the respiration waveform becomes small. When the inspiration temperature increases higher than the expiration temperature, the phases of expiration and inspiration may be reversed.

Changing Respiration Settings

Change settings on the RESP/CO_2 window. The following settings can be changed for respiration monitoring.

For impedance method

- Turning respiration monitoring on or off
- Changing monitoring lead
- Respiration sensitivity
- Respiration rate and apnea alarm limits
- Respiration waveform sweep speed

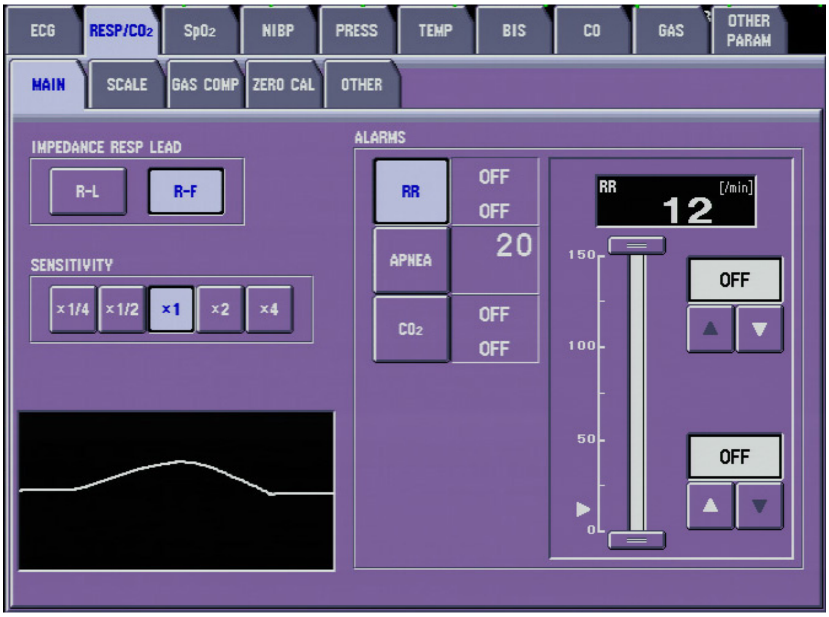
For thermistor method

- Respiration sensitivity
- Respiration rate and apnea alarm limits
- Respiration waveform sweep speed

The noise reduction for impedance respiration monitoring can be turned on or off and respiration data display color can be set on the SYSTEM SETUP window.

The scale of the respiration rate trendgraph on the home screen is the same scale as the trendgraph of the Review window.

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
GAS COMP
ZERO CAL
OTHER
IMPEDANCE RESP LEAD
R-L
R-F
SENSITIVITY
×1/4
×1/2
×1
×2
×4
ALARMS
RR
OFF
OFF
APNEA
20
CO2
OFF
OFF
RR
[/min]
12
150
100
50
0
OFF
OFF

<IMPEDANCE RESP LEAD>: Select the monitoring lead.

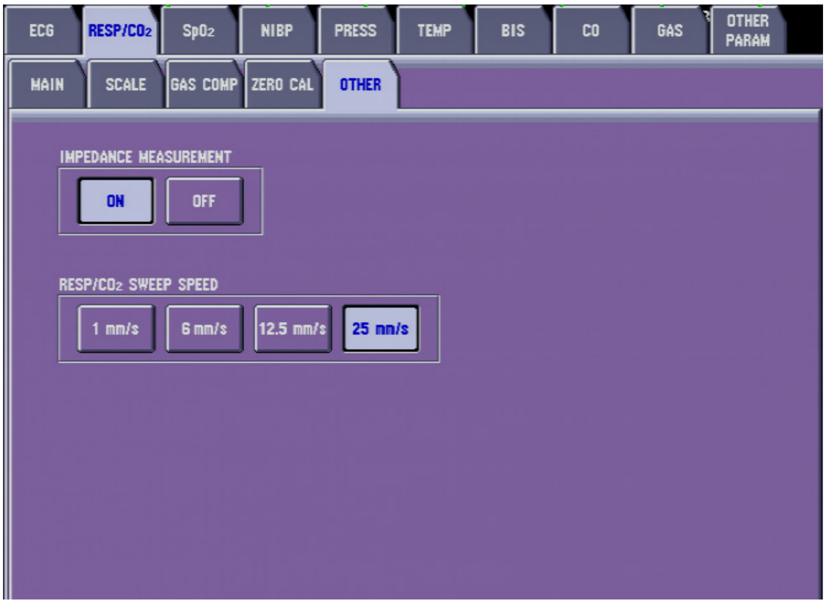
<SENSITIVITY>: Select sensitivity for respiration waveform on the home screen and recording paper.

<ALARMS>:

RR alarm limits: Set the upper and lower respiration rate alarm limits.

APNEA alarm limit: Set the apnea alarm limit.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
GAS COMP
ZERO CAL
OTHER
IMPEDANCE MEASUREMENT
ON
OFF
RESP/CO2 SWEEP SPEED
1 mm/s
6 mm/s
12.5 mm/s
25 mm/s

<IMPEDANCE MEASUREMENT>: Select respiration monitoring in impedance method on or off.

<RESP/CO_2 SWEEP SPEED>: Select the respiration waveform sweep speed.

CO_2

CO_2 monitoring by the mainstream method is performed by connecting the TG-900P, TG-920P, TG-950P or TG-970P CO_2 sensor kit to the patient's respiration circuit or directly to the patient and connect the CO_2 sensor kit to the MULTI socket or PRESS CO_2 socket on the unit. When monitoring with the TG-950P or TG-970P CO_2 sensor kit, $FiCO_2$ is also monitored.

CO_2 by the sidestream method can be monitored when the optional AG-400R CO_2 unit or Oridion portable bedside monitor Microcap® is connected to the monitor. For details on the sidestream method, refer to the AG-400R CO_2 unit or Oridion portable bedside monitor Microcap® manual.

NOTE:
- TG-950P CO_2 sensor kit is not available for BSM-6000A series.
- AG-400R CO_2 unit is not available for BSM-6000A series.
- Oridion portable bedside monitor Microcap® is not available for BSM-6000K series.

Semi-quantitative method using the TG-900P or TG-920P CO_2 sensor kit
Measurements are based on the assumption of no CO_2 gas in the inspiration. The CO_2 concentration in the respiration is calculated by taking the CO_2 concentration in the inspiration as 0 mmHg (0 kPa).

Quantitative method using the TG-950P or TG-970P CO_2 sensor kit
The CO_2 partial pressure in both inspiration and expiration is measured.

WARNING

With the TG-900P CO_2 sensor kit, measurements are based on the assumption of no CO_2 gas in the inspiration. The CO_2 concentration in the respiration is calculated by taking the CO_2 concentration in the inspiration as 0 mmHg. Therefore, measuring CO_2 by connecting the CO_2 sensor kit to a Jackson Rees circuit, Mapleson D circuit or any other respiration circuit where CO_2 gas may be present during inspiration may result in the acquired data being lower than the actual value.

WARNING

The TG-970P CO_2 sensor kit cannot correctly measure the $ETCO_2$ value and respiration rate during high frequency oscillation (HFO). Do not diagnose the patient from the $ETCO_2$ value and respiration rate.

CAUTION

With the TG-920P CO_2 sensor kit, measurements are based on the assumption of no CO_2 gas in the inspiration. The CO_2 concentration in the respiration is calculated by taking the CO_2 concentration in the inspiration as 0 mmHg (0 kPa). Therefore, measuring CO_2 of a patient with an oxygen mask where CO_2 gas may be present in the inspiration gas may result in the acquired data being lower than the actual value.

CAUTION

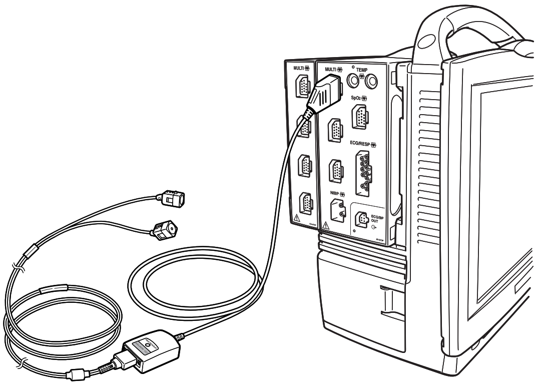
The TG-900P and TG-920P CO_2 sensor kits do not adjust the measurement value to compensate for different atmospheric pressure. Be careful when reading the value when using the CO_2 sensor kit at high altitudes because the measurement value may be inaccurate.

* The measurement value drops 0.13 kPa (1 mmHg) for 5.33 kPa (40 mmHg) CO_2 gas when an atmospheric pressure drops 3.3 kPa.

NOTE:

- Only one MULTI socket can be used for monitoring CO_2. The sidestream and mainstream methods cannot be monitored at the same time.
- When the AG-920R, GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit is connected to the monitor, turn off the AG-920R multigas unit power or disconnect the multi-link cable of the GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit from the monitor while monitoring CO_2 by mainstream method. The CO_2 alarm from mainstream method cannot be indicated when the multigas unit or multigas/flow unit is turned on. (GF-210R multigas unit and GF-120PA or GF-220R multigas/flow unit are not available for BSM-6000A series.)
- When using N_2O anesthetic gas (nitrous oxide), set the gas composition on the GAS COMP window.

Preparation



Connect the CO_2 sensor kit to the MULTI socket on the input unit or smart expansion unit and connect the airway adapter to the CO_2 sensor.

Types of CO_2 Sensor Kits

Model	Method	Attachment
TG-900P	Semi-quantitative	Used on an intubated patient
TG-920P	Semi-quantitative	Attach to the patient nose or used on an intubated patient
TG-950P	Quantitative	Used on an intubated patient
TG-970P		

The CO_2 sensor kits require airway adapter or nasal adapter.

CO_2 sensor kit	Airway adapter/Nasal adapter	Weight	Dead space volume	Code No.
TG-900P	YG-101T airway adapter	10 kg or more	5 mL	R801
TG-920P	YG-111T airway adapter	7 kg or more	4 mL	R804
	YG-120T nasal adapter	10 kg or more	1.2 mL	V921
	YG-121T nasal adapter			V922
	YG-122T nasal adapter			V923
TG-950P	YG-201T airway adapter for adult	10 kg or more	5 mL	R802
	YG-202T airway adapter for child	3 to 10 kg	2 mL	R803
TG-970P	YG-211T airway adapter	7 kg or more	4 mL	R805

WARNING

When using the airway adapter or nasal adapter on a patient with low ventilatory volume, the CO_2 may mix in the inspiration due to the airway adapter's dead space, resulting in inaccurate measured values or difficulty in detecting apnea. Perform ventilation taking into consideration the dead space of the adapters.

CAUTION

Select the airway adapter or nasal adapter taking into consideration the patient weight and ventilation volume. If an inappropriate airway adapter or nasal adapter is used, the resistance in the respiration circuit increases and it causes incorrect measurement value.

CAUTION

When the “CHANGE ADAPTER” or “SENSOR ERROR” message is displayed, check the CO_2 sensor kit and replace it if necessary. CO_2 cannot be monitored while the message is displayed.

CAUTION

The CO_2 data may be inaccurate when monitoring a patient with an extremely high respiration rate or irregular respiration. Read the measured values carefully.

CAUTION

Make sure that the gas composition is entered. Otherwise the measurement result may be inaccurate.

CAUTION

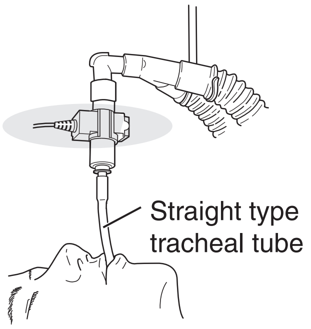
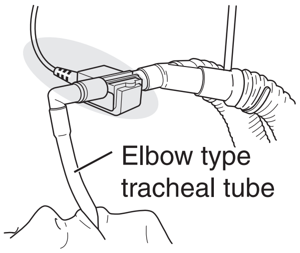
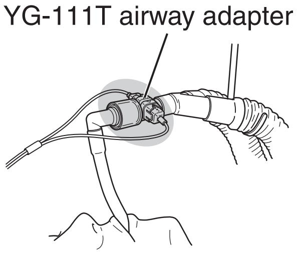
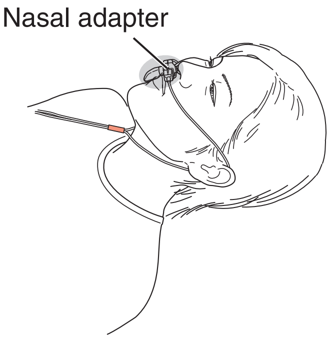
When using an anesthetic instrument with a volatile anesthetic agent, the CO_2 measurement may be inaccurate.

NOTE: The measurement may be inaccurate when monitored in the following conditions. Read the measured values carefully.

- When used in environments with high concentration nitrous oxide gas.
- When used in environments with sudden temperature changes.
- When used in environments with severe humidity.

NOTE: For intubated patients, connect the CO_2 sensor as in the following example so that the sensor does not touch the patient.

Connection example

For intubated patients	For non-intubated patients
TG-900P/TG-950P/TG-970P   TG-920P  	TG-920P 

Using the TG-920P CO_2 sensor kit

WARNING

The only oxygen cannula that can be used with YG-122T is manufactured by HUDSON RCI®. Do not use any other oxygen cannula. Other oxygen cannulas cannot be attached and oxygen cannot be delivered to the patient through the nostrils.

WARNING

Check that the oxygen cannula tube is not bent, broken, or blocked by the nasal tube. If the ends of the oxygen cannula tube turn too far up or down, it causes insufficient O_2 supply or the CO_2 value may be incorrect.

CAUTION

When using the YG-121T/YG-122T nasal adapter on a patient with bleeding disorder, poor general medical condition or malnutrition, observe the patient condition all the time. The mouth guide touches the mouth and may cause pressure sores.

WARNING

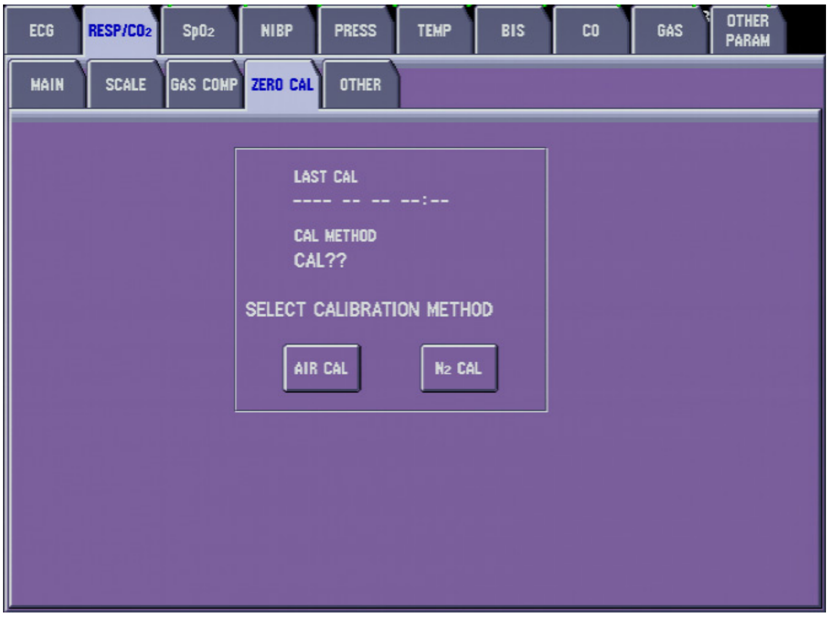
- When you use YG-122T together with an oxygen cannula, check that the oxygen cannula is correctly attached on the patient by referring to other parameters and by observing the patient periodically.
- If arterial oxygen saturation does not increase, immediately stop using the oxygen cannula with the CO_2 sensor kit and select another way to supply oxygen.

Performing Calibration

When using the TG-950P or TG-970P CO_2 sensor kit, perform zero calibration in the following conditions before connecting the CO_2 sensor to the respiration circuit.

- When the airway adapter is replaced with a new one.
- When a different type of airway adapter is used.
- When the operating temperature changes.
- When the measurement room is changed.
- Whenever necessary.

On the ZERO CAL Page



LAST CAL
---- -- -- --:--
CAL METHOD
CAL??
SELECT CALIBRATION METHOD

Zero calibration can be performed in two ways: calibration with air and calibration with N_2 gas. Both methods are performed on the RESP/CO_2 window.

- Calibration with air
  1. Touch the AIR CAL key.
  2. Expose the airway adapter to air.
  3. Touch the YES key. The CO_2 sensor is calibrated with about 0.2 mmHg (0.03 kPa) CO_2 in the air.

- Calibration with N_2 gas
  1. Touch the N_2 CAL key.
  2. Flow N_2 gas into the airway adapter.
  3. Touch the YES key. The CO_2 sensor is calibrated.

Changing CO_2 Settings

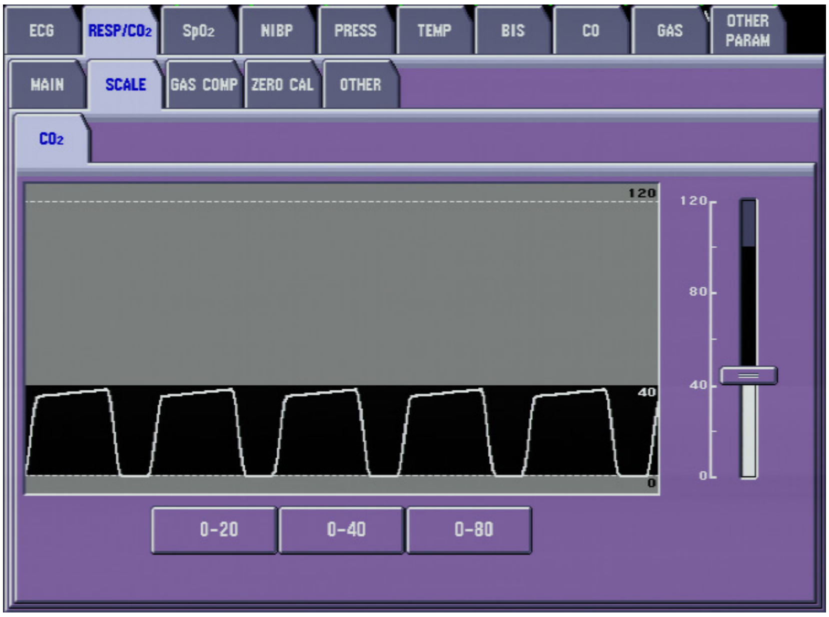
Change the settings on the RESP/CO_2 window. The following settings can be changed for CO_2 monitoring.

- Scale
- Respiration rate, apnea and inspired CO_2 alarm settings
- Inspiration composition
- CO_2 waveform sweep speed

The CO_2 unit can be set to mmHg or kPa on the SYSTEM CONFIGURATION screen.

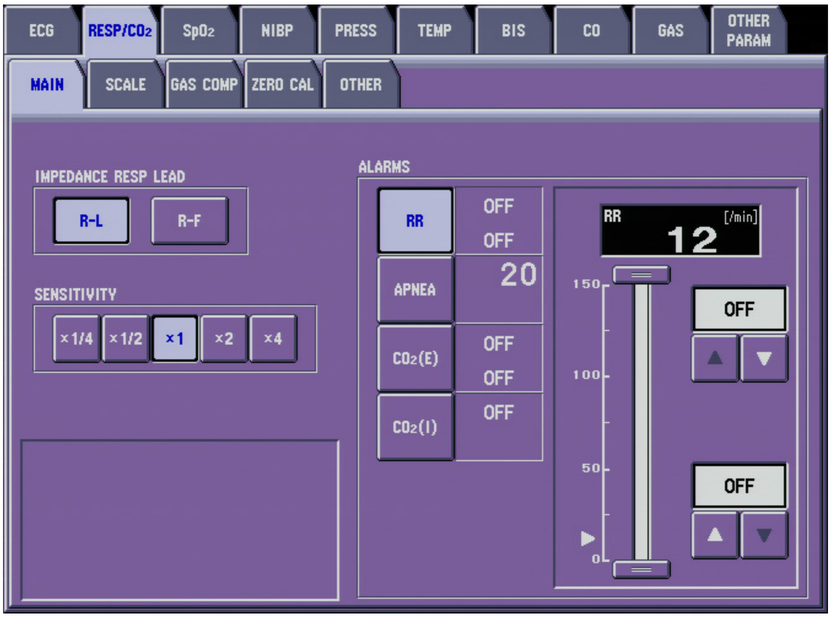
The CO_2 data display color and CO_2 waveform fill in or not can be set on the SYSTEM SETUP window.

On the SCALE Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
GAS COMP
ZERO CAL
OTHER
CO2
120
40
0
120
80
40
0
0-20
0-40
0-80

Select the scale by touching the desired scale key. You can adjust the scale using the scale slider.

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
GAS COMP
ZERO CAL
OTHER
IMPEDANCE RESP LEAD
R-L
R-F
SENSITIVITY
×1/4
×1/2
×1
×2
×4
ALARMS
RR
OFF
OFF
APNEA
20
CO2(E)
OFF
OFF
CO2(I)
OFF
RR [/min]
12
150
100
50
0
OFF
▲
▼
OFF
▲
▼

<ALARMS>

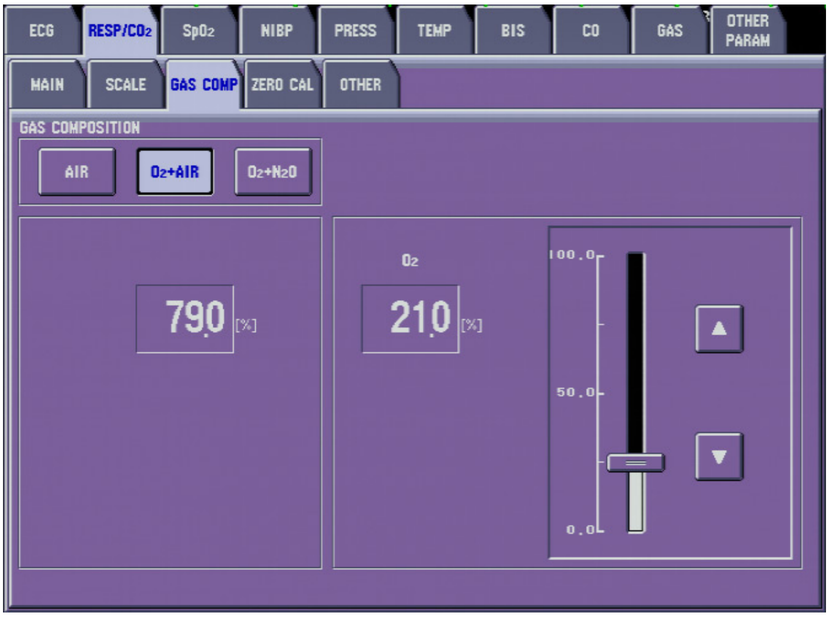
RR alarm limits: Set the upper and lower respiration rate alarm limits.

APNEA alarm limit: Set the apnea alarm limit.

CO_2(E) alarm limits: Set the upper and lower expired CO_2 alarm limits.

CO_2(I) alarm limits: Set the upper inspired CO_2 alarm limits when monitoring CO_2 with TG-950P or TG-970P CO_2 sensor kit or by sidestream method.

On the GAS COMP Page


ECG
RESP/CO₂
SpO₂
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
GAS COMP
ZERO CAL
OTHER
GAS COMPOSITION
AIR
O₂+AIR
O₂+N₂O
79.0 [%]
O₂
21.0 [%]
100.0
50.0
0.0
▲
▼

<GAS COMPOSITION>: When using anesthetic gas or a respirator, set the inspiration composition.

This setting is not required when monitoring CO_2 by sidestream method.

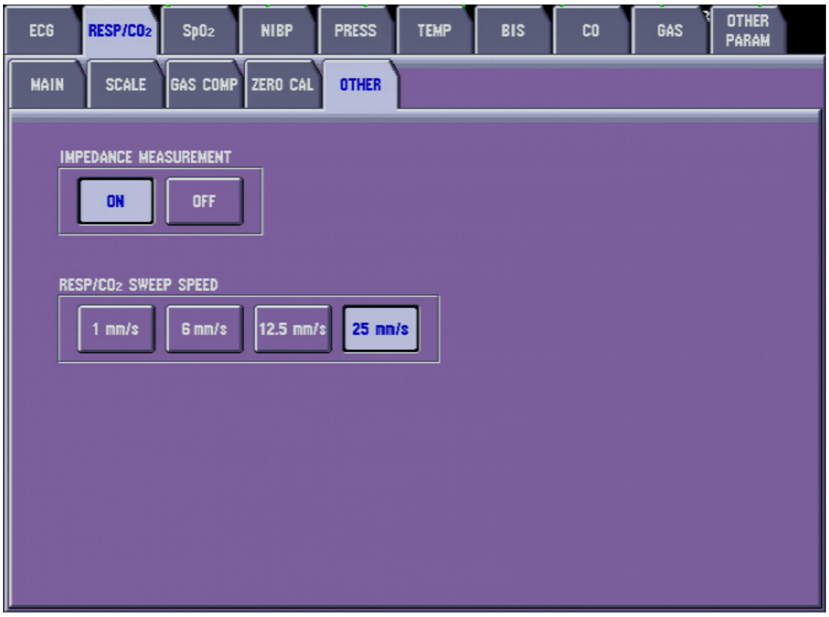
CAUTION

Make sure that the gas composition is entered. Otherwise the measurement result may be inaccurate.

CAUTION

When using an anesthetic instrument with a volatile anesthetic agent, the CO_2 measurement may be inaccurate.

On the OTHER Page


ECG
RESP/CO₂
SpO₂
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
GAS COMP
ZERO CAL
OTHER
IMPEDANCE MEASUREMENT
ON
OFF
RESP/CO₂ SWEEP SPEED
1 mm/s
6 mm/s
12.5 mm/s
25 mm/s

<RESP/CO_2 SWEEP SPEED>: Select the CO_2 waveform sweep speed.

Inspection of Measuring Accuracy

The inspection of measuring accuracy must be performed by the qualified service personnel.

CAUTION

Follow the CAUTION label on the CO_2 gas cylinder.

SpO$_2$ with Nihon Kohden Probes (AY-660P/AY-661P/AY-663P/AY-671P/AY-673P)

WARNING

SpO$_2$ measurement may be incorrect in the following cases.

- When the patient's carboxyhemoglobin or methemoglobin increases abnormally.
- When dye is injected in the blood.
- When using an electrosurgical unit.
- During CPR.
- When measuring at a site with venous pulse.
- When there is body movement.
- When the pulse wave is small (insufficient peripheral circulation).

WARNING

- When using the TL-201T finger probe, do not fasten the probe and cable to the finger by wrapping with tape. This may cause burn, congestion or pressure necrosis from poor blood circulation.
- When using probes other than the TL-201T finger probe, to avoid poor circulation, do not wrap the tape too tight. Check the blood circulation condition by observing the skin color and congestion at the skin peripheral to the probe attachment site. Even for short-term monitoring, there may be burn or pressure necrosis from poor blood circulation, especially on neonates or low birth weight infants whose skin is delicate. Accurate measurement cannot be performed on a site with poor peripheral circulation.

WARNING

Check the circulation condition by observing the skin color at the measurement site and pulse waveform. Change the measurement site every 8 hours for disposable probes and every 4 hours for reusable probes (every 8 hours for TL-630T3/TL-631T3 probe). The skin temperature may increase at the attached site by 2 or 3°C (4 or 5°F) and cause a burn or pressure necrosis. When using the probe on the following patients, take extreme care and change the measurement site more frequently according to symptoms and degree.

- Patient with a fever
- Patient with peripheral circulation insufficiency
- Neonate or low birth weight infant with delicate skin

WARNING

When monitoring SpO$_2$ of a patient who is receiving photodynamic therapy, the light from the finger probe sensor may cause a burn. Photodynamic therapy uses a photosensitizing agent that has a side effect of photosensitivity.

The SpO$_2$ probe manufactured by Nihon Kohden have two wavelengths with peaks in the range of 650 and 950 nm. The maximum light intensity is less than 5.5 mW.

WARNING

When not monitoring SpO$_2$, disconnect the SpO$_2$ connection cord from the input unit. Otherwise, noise from the probe sensor may interfere and incorrect data is displayed on the screen.

CAUTION

Turn off the power of mobile phones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for devices allowed by the hospital administrator). Radio waves from devices such as mobile phones or small wireless devices may be mistaken as pulse waves and the displayed data may be incorrect.

CAUTION

Only use the specified probes. Otherwise, SpO$_2$ cannot be monitored.

CAUTION

Normal external light does not affect monitoring but strong light such as a surgical light or sunlight may affect monitoring. If affected, cover the measuring site with a blanket.

CAUTION

While a patient is on medication which causes vasodilation, the pulse waveform may change and in rare cases the SpO_2 value might not be displayed.

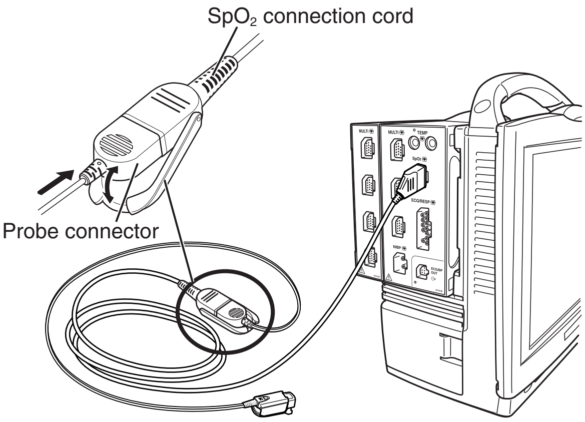
NOTE: Do not attach the probe to the same limb that is used for NIBP measurement or an IBP catheter. The SpO_2 measurement may be incorrect.

Silencing SpO_2 Alarm

This function is only available for BSM-6000A series. When the <SILENCE SpO_2 ALARM> on the ALARM window of the SYSTEM SETUP window is set to ON, a second occurring SpO_2 alarm can be silenced when the [Silence Alarms] key is pressed.

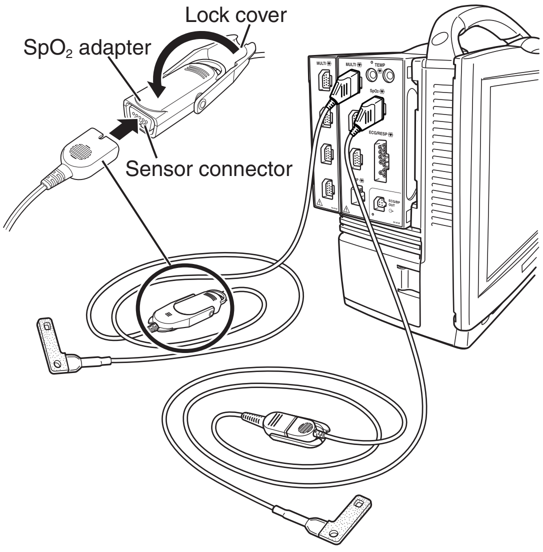
NOTE: When the <SILENCE SpO_2 ALARM> is set to ON and the monitored SpO_2 value is close to the SpO_2 upper and lower alarm limit setting, you may have to press the [Silence Alarm] key several times to silence the SpO_2 alarm.

Preparation



When connecting the TL-201T finger probe to the SpO_2 socket

Select the appropriate probe according to purpose. To connect a Nihon Kohden probe to the SpO_2 socket on the AY-660P, AY-661P, AY-663P, AY-671P or AY-673P input unit, the JL-900P SpO_2 connection cord is required.



When connecting the TL-051S/052S probes to the SpO_2 socket and MULTI socket to monitor dual SpO_2

To monitor SpO_2 at two sites (dual SpO_2), connect a Nihon Kohden probe to the SpO_2 socket and another probe to the MULTI socket on the AY-661P, AY-663P, AY-671P or AY-673P input unit, AA-672P or AA-674P smart expansion unit. The MULTI socket on the AY-660P input unit cannot be used.

To connect a Nihon Kohden probe to the MULTI socket, the JL-500P1 or JL-500P2 SpO_2 adapter is required.

When Monitoring Dual SpO_2

CAUTION

When two probes are attached too close to each other, the light from the probes interferes with each other and SpO_2 cannot be monitored properly. Make sure that there is no light interference when attaching two probes.

Reusable Probes

Model	Subject (Weight)	Attachment Site
Finger Probe TL-201T	Adults, children (Weight more than 20 kg)	Finger
Multi-site Probe TL-220T	Adults, infants (Weight more than 3 kg)	Finger or toe
	Neonates (Weight less than 3 kg)	Instep and sole
Finger Probe TL-630T3	Adults, children (Weight more than 50 kg)	Finger
Finger Probe TL-631T3	Adults, children (Weight more than 20 kg)	Finger or toe

Disposable Probes

Model	Subject (Weight)	Attachment Site
TL-260T*	Adults, children (Weight more than 3 kg)	Finger or toe
	Neonates (Weight less than 3 kg)	Instep and sole
TL-271T/271T3 Cable length TL-271T: 80 cm TL-271T3: 160 cm	Adults (Weight more than 30 kg)	Finger or toe
TL-272T/272T3 Cable length TL-272T: 80 cm TL-272T3: 160 cm	Children (Weight from 10 to 50 kg)	Finger or toe
TL-273T/273T3 Cable length TL-273T: 80 cm TL-273T3: 160 cm	Neonates (Weight less than 3 kg)	Instep
	Adults (Weight more than 40 kg)	Finger or toe
TL-274T/274T3 Cable length TL-274T: 80 cm TL-274T3: 160 cm	Infants (Weight from 3 to 20 kg)	Finger or toe
TL-051S/052S Cable length TL-051S: 80 cm TL-052S: 160 cm	Adults (Weight more than 50 kg)	Finger
	Neonates (Weight less than 3 kg)	Instep and sole
TL-061S/062S Cable length TL-061S: 80 cm TL-062S: 160 cm	Adults, children (Weight from 15 to 50 kg)	Finger
	Children, infants (Weight from 3 to 15 kg)	Toe

* TL-260T multi-site Y probe is not available for BSM-6000A series.

CAUTION

When the probe is attached on an appropriate site with sufficient circulation and an error message about probe attachment repeatedly appears, the probe may be deteriorated. Replace it with a new one.

CAUTION

When a message indicates a faulty probe or faulty SpO_2 connection cord, stop monitoring and replace the probe or SpO_2 connection cord with a new one.

CAUTION

If the attachment site is dirty with blood or bodily fluids, clean the attachment site before attaching the probe. If there is nail polish on the attachment site, remove the polish. Otherwise, the amount of transmitted light decreases, and measured value may be incorrect or measurement cannot be performed.

NOTE:
- In order to maintain sufficient blood circulation, keep the measurement site warm by covering with a blanket or something similar. Warming the site is effective, especially for a patient with a small pulse amplitude.
- Connect the probe and SpO_2 connection cord until you hear a stopper of the SpO_2 connection cord click.

Changing SpO_2 Settings

Change settings on the SpO_2 window. The following settings can be changed for SpO_2 monitoring.
- Pulse waveform sensitivity
- SpO_2 and pulse rate alarm limits
- Display pulse rate in SpO_2 numeric data area on the home screen

The following settings can be changed on the SpO_2-2 window for dual SpO_2 monitoring.
- Pulse waveform sensitivity
- SpO_2-2 and ΔSpO_2 alarm limits
- Display SpO_2-2 pulse rate and/or ΔSpO_2 in SpO_2-2 numeric data area on the home screen

The following settings are common settings for SpO_2 and SpO_2-2.
- Sync source
- Sync sound pitch
- Response mode
- Sensitivity mode (when using BSM-6000 series software version 03-01 or later, AY-600P series input unit software version 03-01 or later, AY-600P series input unit SpO_2 module version 01-11 or later, or JL-500P1/P2 version 01-11 or later. The version can be confirmed on the INFO page of the SYSTEM SETUP window.)

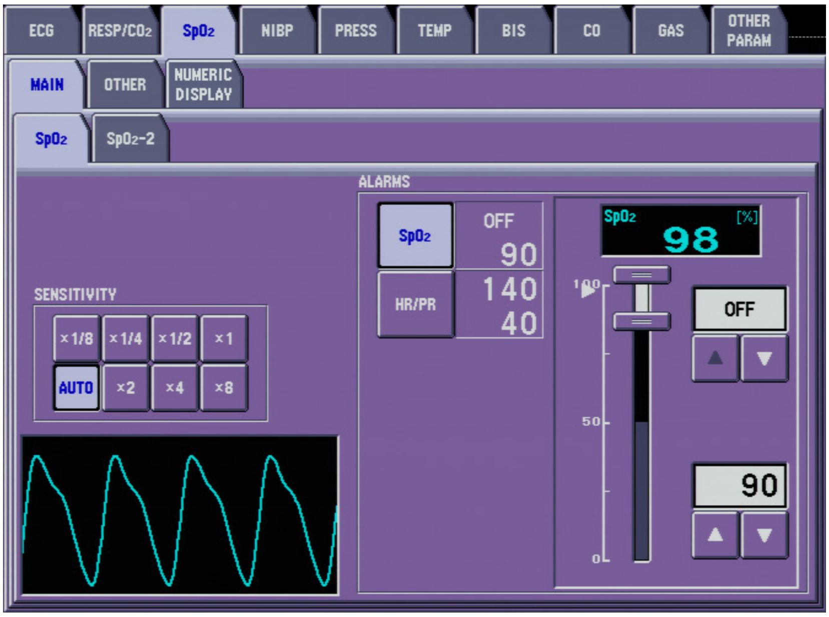
The SpO_2 data display color can be set on the SYSTEM SETUP window.

The scale of the SpO_2 trendgraph on the home screen is the same scale as the trendgraph of the Review window.

The SpO_2 pulse waveform sweep speed is the speed set for <SWEEP SPEED> on the WAVES page of the DISPLAY window.

When monitoring dual SpO_2, display the SpO_2-2 page of the SpO_2 window to change the SpO_2-2 settings (AY-661P, AY-663P, AY-671P or AY-673P input unit only).

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SpO2
SpO2-2
ALARMS
SpO2
OFF
90
HR/PR
140
40
SpO2 [%]
98
100
50
0
OFF
90
SENSITIVITY
×1/8
×1/4
×1/2
×1
AUTO
×2
×4
×8

SpO_2 Tab

<SENSITIVITY>: Select sensitivity for pulse waveform on the home screen.

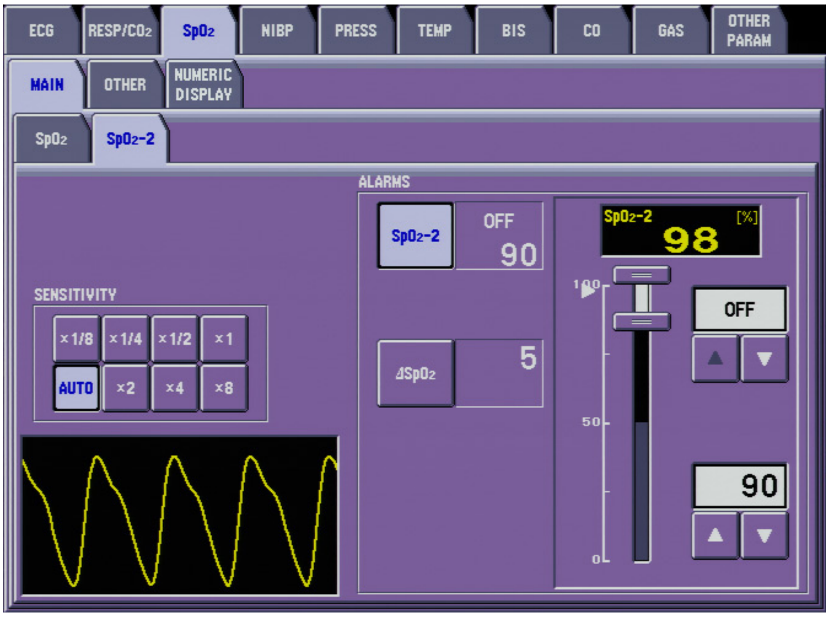
NOTE:

The pulse wave amplitude varies according to pulsation component ratio of whole transmitted IR signal. When the pulsation component ratio is 1%, the pulse wave amplitude becomes about 10 mm at ×1 setting on the display.

<ALARMS>

SpO_2 alarm limits: Set the upper and lower SpO_2 alarm limits.

HR/PR alarm limits: Set the upper and lower heart rate or pulse rate alarm limits.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SpO2
SpO2-2
ALARMS
SpO2-2
OFF
90
ΔSpO2
5
SpO2-2 [%]
98
100
50
0
OFF
90
SENSITIVITY
×1/8
×1/4
×1/2
×1
AUTO
×2
×4
×8

SpO_2-2 Tab

<SENSITIVITY>: Select sensitivity for SpO_2-2 pulse waveform on the home screen.

NOTE:

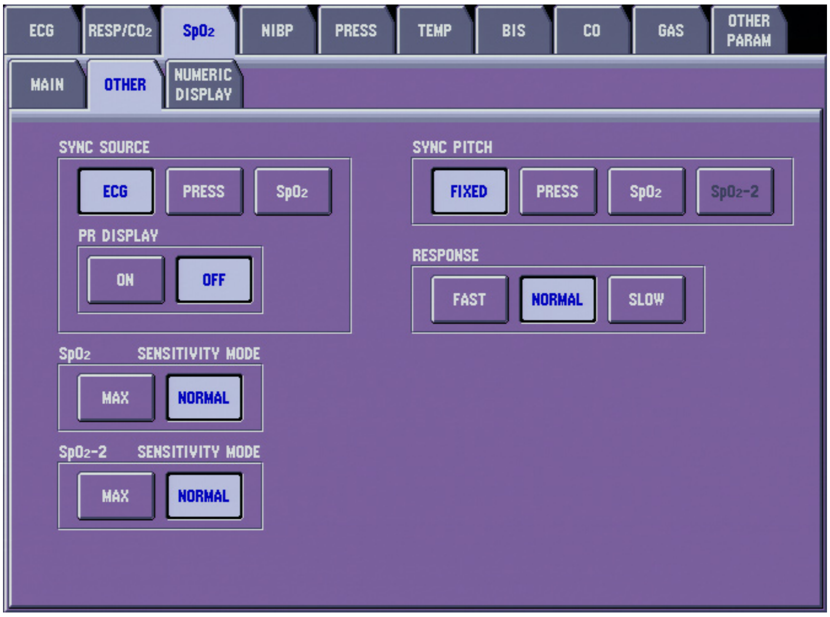
The pulse wave amplitude varies according to pulsation component ratio of whole transmitted IR signal. When the pulsation component ratio is 1%, the pulse wave amplitude becomes about 10 mm at ×1 setting on the display.

<ALARMS>

SpO_2-2 alarm limits: Set the upper and lower SpO_2 alarm limits.

ΔSpO_2 alarm limit: Set the upper ΔSpO_2 alarm limit.

On the OTHER Page



<SYNC SOURCE>: Select the sync sound source from ECG (heart rate), SpO_2 and arterial blood pressure (PRESS).

NOTE:

- When heart rate is unstable because of an ESU, select SpO_2 or PRESS.
- When the connection cord of SpO_2 or IBP of the arterial blood pressure is disconnected from the monitor and an alarm occurs when the sync source is set to SpO_2 or PRESS, the sync source changes to ECG when the alarm is silenced by pressing the [Silence Alarms] key. The sync source returns to SpO_2 or PRESS when the SpO_2 or IBP is monitored again. When using IBP as the sync source, adjust zero balance.
- When the sensor is detached from the patient and alarm occurs, and the sync source is set to SpO_2 or PRESS, the sync source does not change to ECG when the alarm is silenced, and “- - -” is displayed for PR.
- The SpO_2-2 cannot be set to the sync sound source.

<PR DISPLAY>: Select the pulse rate display on or off. This setting is only available when <SYNC SOURCE> is set to ECG.

<SYNC PITCH>: Select the sync sound pitch.

FIXED: The pitch is fixed to the pitch selected on the SYSTEM SETUP window.

PRESS: The pitch is high when the BP value is above 120 mmHg. The pitch is low when the BP value is below 20 mmHg. The pitch changes in 20 steps from high to low for each 5 mmHg change between 120 and 20 mmHg BP value. The BP value of the highest priority arterial blood pressure is used.

SpO_2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2 connected to the SpO_2 socket.

SpO_2-2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2-2 connected to the MULTI socket. SpO_2-2 is only available for the AY-661P, AY-663P, AY-671P or AY-673P input unit.

<RESPONSE>: Select the response mode.

FAST: Select this for special applications that require a fast response. “Fast” is suitable for detecting short apnea.

NORMAL: For normal monitoring.

SLOW: Select this when you need to suppress a rapid change in SpO_2.

For details on the response time, refer to the SpO_2 specifications in this manual.

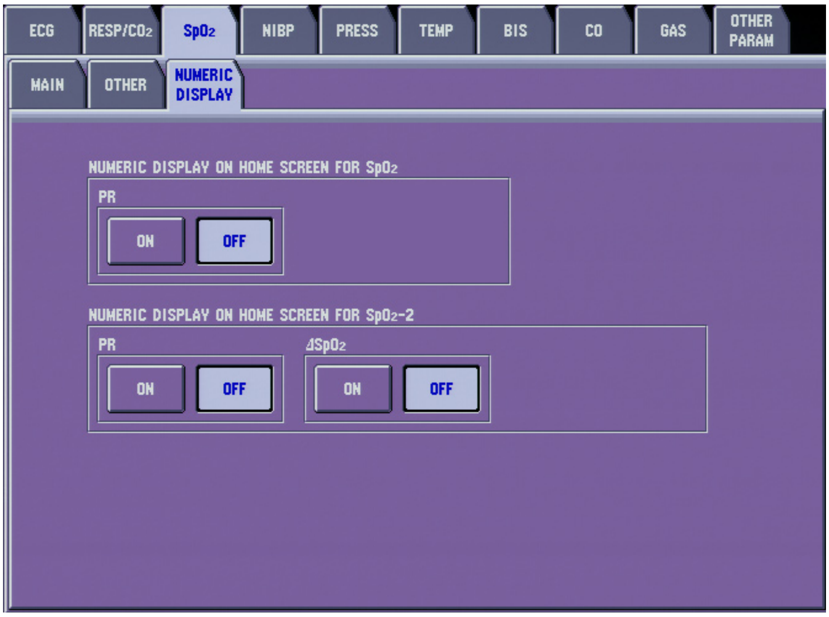
<SpO_2 SENSITIVITY MODE>: Select the sensitivity mode for SpO_2.

MAX: This mode should be used for a critical patient, where obtaining a reading is most difficult. MAX mode is designed to interpret and display data for even the weakest of signals. This mode is recommended during procedures and when clinician and patient contact is continuous.

NORMAL: This mode provides the best combination of sensitivity and probe-off detection performance. This mode is recommended for most patients.

<SpO_2-2 SENSITIVITY MODE>: Select the sensitivity mode for SpO_2-2.
MAX: This mode should be used for a critical patient, where obtaining a reading is most difficult. MAX mode is designed to interpret and display data for even the weakest of signals. This mode is recommended during procedures and when clinician and patient contact is continuous.
NORMAL: This mode provides the best combination of sensitivity and probe-off detection performance. This mode is recommended for most patients.

On the NUMERIC DISPLAY Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
NUMERIC DISPLAY ON HOME SCREEN FOR SpO2
PR
ON
OFF
NUMERIC DISPLAY ON HOME SCREEN FOR SpO2-2
PR
ON
OFF
ΔSpO2
ON
OFF

<NUMERIC DISPLAY ON HOME SCREEN FOR SpO_2>: Select the PR display on or off in the SpO_2 area on the home screen.

<NUMERIC DISPLAY ON HOME SCREEN FOR SpO_2-2>: Select the PR and ΔSpO_2 display on or off in the SpO_2-2 area on the home screen.

SpO_2 with Nellcor Probes (AY-651P/AY-653P)

WARNING

SpO_2 measurement may be incorrect in the following cases.

- When the patient's carboxyhemoglobin or methemoglobin increases abnormally.
- When dye is injected in the blood.
- When using an electrosurgical unit.
- During CPR.
- When measuring at a site with venous pulse.
- When there is body movement.
- When the pulse wave is small (insufficient peripheral circulation).

WARNING

To avoid poor circulation, do not wrap the tape too tight. Check the blood circulation condition by observing the skin color and congestion at the skin peripheral to the probe attachment site. Even for short-term monitoring, there may be burn or pressure necrosis from poor blood circulation, especially on neonates or low birth weight infants whose skin is delicate. Accurate measurement cannot be performed on a site with poor peripheral circulation.

WARNING

Check the circulation condition by observing the skin color at the measurement site and pulse waveform. Change the measurement site every 8 hours for disposable probes and every 4 hours for reusable probes. When using the probe on the following patients, take extreme care and change the measurement site more frequently according to symptoms and degree.

- Patient with a fever
- Patient with peripheral circulation insufficiency
- Neonate or low birth weight infant with delicate skin

WARNING

When monitoring SpO_2 of a patient who is receiving photodynamic therapy, the light from the finger probe sensor may cause a burn. Photodynamic therapy uses a photosensitizing agent that has a side effect of photosensitivity.

WARNING

When not monitoring SpO_2, disconnect the SpO_2 connection cord from the input unit. Otherwise, noise from the probe sensor may interfere and incorrect data is displayed on the screen.

CAUTION

Turn off the power of mobile phones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for devices allowed by the hospital administrator). Radio waves from devices such as mobile phones or small wireless devices may be mistaken as pulse waves and the displayed data may be incorrect.

CAUTION

While a patient is on medication which causes vasodilation, the pulse waveform may change and in rare cases the SpO_2 value might not be displayed.

CAUTION

Only use the specified probes. Otherwise, SpO_2 cannot be monitored.

CAUTION

Normal external light does not affect monitoring but strong light such as a surgical light or sunlight may affect monitoring. If affected, cover the measuring site with a blanket.

NOTE:

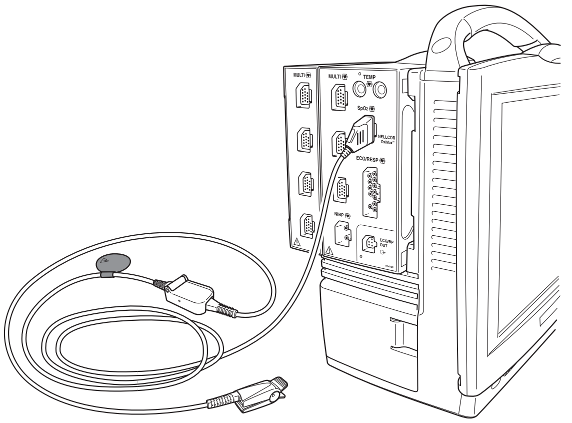
- Purchase of this instrument confers no express or implied license under any Nellcor Puritan Bennett patent to use this instrument with any oximetry sensor that is not manufactured or licensed by Nellcor Puritan Bennett.
- Do not attach the probe to the same limb that is used for NIBP measurement or an IBP catheter. The SpO_2 measurement may be incorrect.

Silencing SpO_2 Alarm

This function is only available for BSM-6000A series. When the <SILENCE SpO_2 ALARM> on the ALARM window of the SYSTEM SETUP window is set to ON, a second occurring SpO_2 alarm can be silenced when the [Silence Alarms] key is pressed.

NOTE: When the <SILENCE SpO_2 ALARM> is set to ON and the monitored SpO_2 value is close to the SpO_2 upper and lower alarm limit setting, you may have to press the [Silence Alarm] key several times to silence the SpO_2 alarm.

Preparation



Select the appropriate probe according to purpose. To connect a Nellcor probe to the SpO_2 socket on the AY-651P or AY-653P input unit, the JL-650P SpO_2 connection cord is required. The Nellcor probes are available direct from Covidien-Nellcor or their suppliers.

Monitoring SpO_2 at two sites (dual SpO_2) with Nellcor probes are available. To monitor dual SpO_2, the IF-919P communication cable and a Nellcor OxiMax^{TM} N-600x^{TM} pulse oximeter are required. Connect a Nellcor probe to the SpO_2 socket on the AY-651P or AY-653P input unit, another probe to the OxiMax^{TM} N-600x^{TM} pulse oximeter and connect the pulse oximeter to the multi-link socket on the montior with the IF-919P communication cable.

When Monitoring Dual SpO_2

CAUTION

When using the Nellcor OxiMax^{TM} N-600x^{TM} pulse oximeter, the “Sensor Message” on the pulse oximeter do not function on the bedside monitor. When the SpO_2 data on the bedside monitor is abnormal, check the data on the pulse oximeter.

CAUTION

When two probes are attached too close to each other, the light from the probes interferes with each other and SpO_2 cannot be monitored properly. Make sure that there is no light interference when attaching two probes.

NOTE:

- If a parameter is not monitored on the pulse oximeter, it is not displayed on the bedside monitor.
- Some parameters cannot be displayed on the bedside monitor even if they are monitored on the pulse oximeter.
- Waveforms from the pulse oximeter are not synchronized with the waveforms measured on the bedside monitor.

Nellcor SpO_2 Probes

OxiMax Adhesive Sensors: Single-page use

Description	Weight Range	Measuring Accuracy	Qty	Catalog #
MAX-FAST Adhesive Forehead Sensor	>10 kg	±2%SpO_2	Case of 24	MAXFAST
MAX-FAST Headband	—	—	Case of 12	10004954
MAX-A Adhesive Sensor, adult	>30 kg	±2%SpO_2	Case of 24	MAXA
MAX-AL Adhesive Sensor, adult (longer, 36 inch cable)	>30 kg	±2%SpO_2	Case of 24	MAXAL
MAX-N Adhesive Sensor, neonatal/adult	<3 kg or >40 kg	±2%SpO_2	Case of 24	MAXN
MAX-P Adhesive Sensor, pediatric	10 to 50 kg	±2%SpO_2	Case of 24	MAXP
MAX-I Adhesive Sensor, infant	3 to 20 kg	±2%SpO_2	Case of 24	MAXI
MAX-R Adhesive Sensor, adult nasal	>50 kg	±3.5%SpO_2	Case of 24	MAXR
MAX Sensor Assortment Pack (2 MAX-A and 2 MAX-N sensors)	—	±2%SpO_2	1	MAXPACI

OxiMax OxiCliq® Sensors: Reusable cable with adhesive sensor bandage

Description	Weight Range	Measuring Accuracy	Qty	Catalog #
OxiCliq Sensor Cable (3 ft)	—	—	1	OC-3
OxiCliq A, adult	>30 kg	±2.5%SpO_2	Case of 24	A
OxiCliq N, neonatal/adult	<3 kg or >40 kg	Neonate: ±3.5%SpO_2 Adult: ±2.5%SpO_2	Case of 24	N
OxiCliq P, pediatric	10 to 50 kg	±2.5%SpO_2	Case of 24	P
OxiCliq I, infant	3 to 20 kg	±2.5%SpO_2	Case of 24	I

OxiMax Reusable Sensors

Description	Weight Range	Measuring Accuracy	Qty
Durasensor® DS-100A finger-clip sensor, adult	>40 kg	±3%SpO_2	1
Oxiband® OXI-A/N adult/neonatal	<3 kg or >40 kg	Neonate: ±4%SpO_2 Adult: ±3%SpO_2	1
Oxiband OXI-P/I pediatric/infant	<3 kg or >40 kg	±3%SpO_2	1
Dura-Y® D-YS multisite sensor	>1 kg	Neonate: ±4%SpO_2 Infant/Adult: ±3%SpO_2	1
D-YSE ear clip for Dura-Y sensor	>30 kg	±3.5%SpO_2	1
PediCheck™ D-YSPD pediatric spot-check sensor	<3 kg or >40 kg	±3.5%SpO_2	1

For details on how to connect a Nellcor probe to the OxiMax™ N-600x™ pulse oximeter, refer to the pulse oximeter manual. To connect the pulse oximeter to the multi-link socket on the monitor, refer to the IF-919P communication cable operator’s manual.

CAUTION

When the probe is attached on an appropriate site with sufficient circulation and an error message about probe attachment repeatedly appears, the probe may be deteriorated. Replace it with a new one.

CAUTION

When a message indicates a faulty probe or faulty SpO_2 connection cord, stop monitoring and replace the probe or SpO_2 connection cord with a new one.

CAUTION

If the attachment site is dirty with blood or bodily fluids, clean the attachment site before attaching the probe. If there is nail polish on the attachment site, remove the polish. Otherwise, the amount of transmitted light decreases, and measured value may be incorrect or measurement cannot be performed.

CAUTION

Only use the OxiMAX™ series sensor probes on this monitor.

NOTE:
- In order to maintain sufficient blood circulation, keep the measurement site warm by covering with a blanket or something similar. Warming the site is effective, especially for a patient with a small pulse amplitude.
- When using Nellcor probes, read the instructions provided with the probe.

Changing SpO_2 Settings

Change settings on the SpO_2 window. The following settings can be changed on SpO_2 tab for SpO_2 monitoring.
- Pulse waveform sensitivity
- SpO_2 and pulse rate alarm limits
- Display pulse rate in SpO_2 numeric data area on the home screen

The following settings can be changed on the SpO_2-2 tab for dual SpO_2 monitoring.
- Pulse waveform sensitivity
- ΔSpO_2 alarm limits
- Display SpO_2-2 pulse rate and/or ΔSpO_2 in SpO_2-2 numeric data area on the home screen

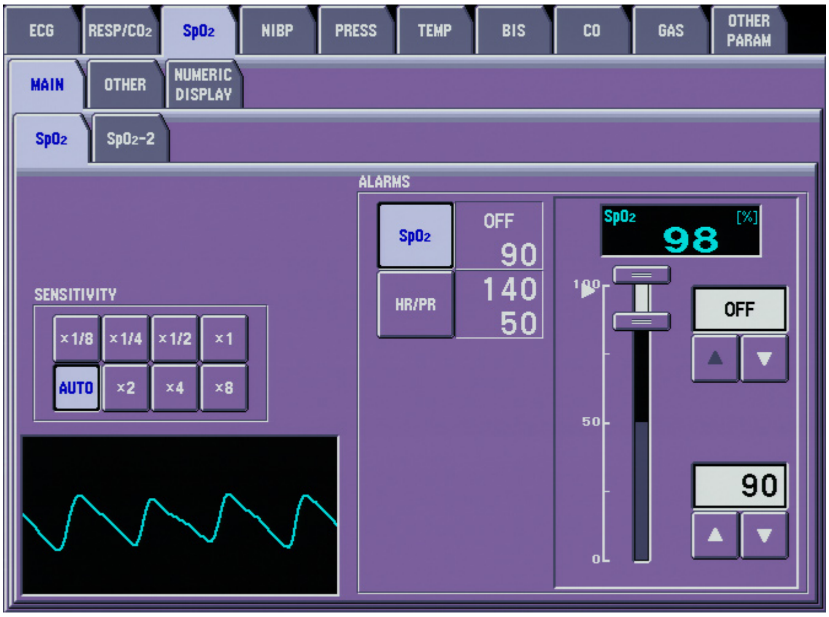
The following settings are common settings for SpO_2 and SpO_2-2.
- Sync source
- Sync sound pitch

The SpO_2 data display color can be set on the SYSTEM SETUP window.

The scale of the SpO_2 trendgraph on the home screen is the same scale as the trendgraph of the Review window.

The SpO_2 pulse waveform sweep speed is the speed set for <SWEEP SPEED> on the WAVES page of the DISPLAY window.

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SpO2
SpO2-2
ALARMS
SENSITIVITY
×1/8
×1/4
×1/2
×1
AUTO
×2
×4
×8
SpO2
OFF
90
HR/PR
140
50
SpO2 [%]
98
100
50
0
OFF
90

SpO$_2$ Tab

<SENSITIVITY>: Select sensitivity for pulse waveform on the home screen.

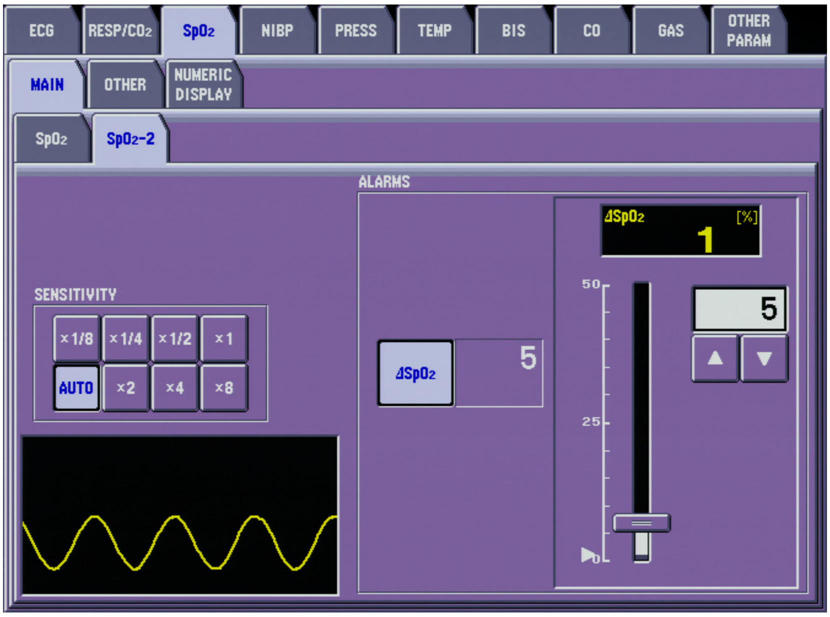
NOTE:

The pulse wave amplitude varies according to pulsation component ratio of whole transmitted IR signal. When the pulsation component ratio is 1%, the pulse wave amplitude becomes about 10 mm at ×1 setting on the display.

<ALARMS>

SpO$_2$ alarm limits: Set the upper and lower SpO$_2$ alarm limits.

HR/PR alarm limits: Set the upper and lower heart rate or pulse rate alarm limits.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SpO2
SpO2-2
ALARMS
SENSITIVITY
×1/8
×1/4
×1/2
×1
AUTO
×2
×4
×8
ΔSpO2
5
ΔSpO2 [%]
1
50
25
0
5

SpO$_2$-2 Tab

<SENSITIVITY>: Select sensitivity for SpO$_2$-2 pulse waveform on the home screen.

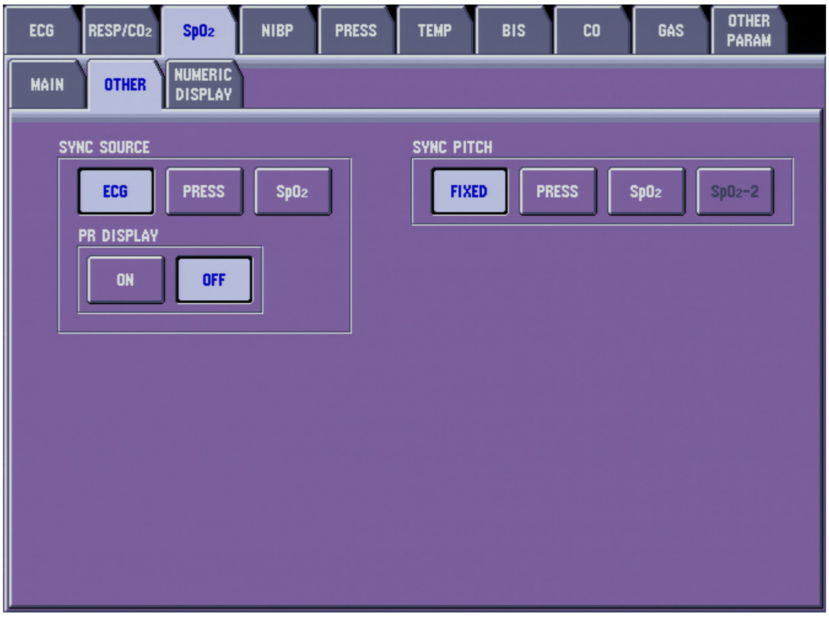
NOTE:

The pulse wave amplitude varies according to pulsation component ratio of whole transmitted IR signal. When the pulsation component ratio is 1%, the pulse wave amplitude becomes about 10 mm at ×1 setting on the display.

<ALARMS>

ΔSpO$_2$ alarm limit: Set the upper ΔSpO$_2$ alarm limit.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SYNC SOURCE
ECG
PRESS
SpO2
PR DISPLAY
ON
OFF
SYNC PITCH
FIXED
PRESS
SpO2
SpO2-2

<SYNC SOURCE>: Select the sync sound source from ECG (heart rate), SpO_2 and arterial blood pressure (PRESS).

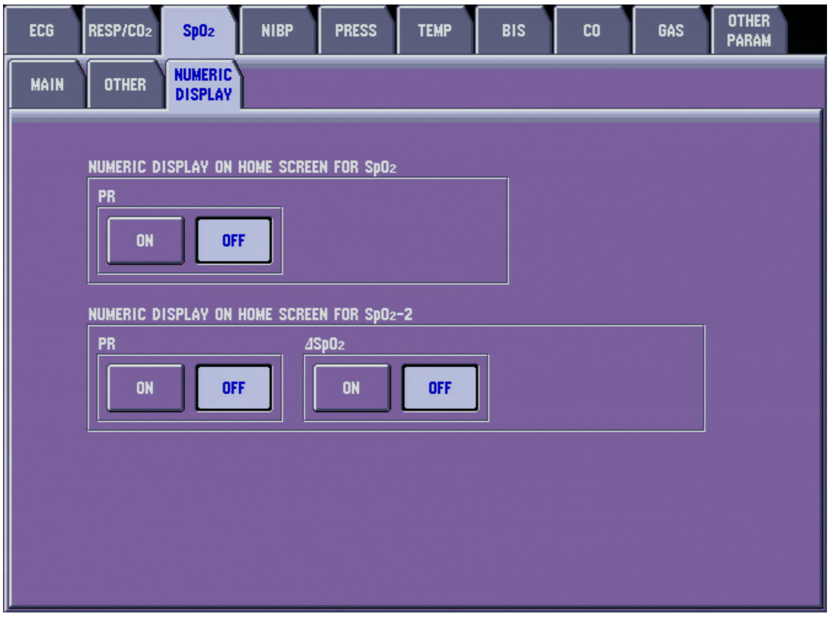
NOTE:

- When heart rate is unstable because of an ESU, select SpO_2 or PRESS.
- When the connection cord of SpO_2 or IBP of the arterial blood pressure is disconnected from the input unit and an alarm occurs when the sync source is set to SpO_2 or PRESS, the sync source changes to ECG when the alarm is silenced by pressing the [Silence Alarms] key. The sync source returns to SpO_2 or PRESS when the SpO_2 or IBP is monitored again. When using IBP as the sync source, adjust zero balance.
- When the sensor is detached from the patient and alarm occurs, and the sync source is set to SpO_2 or PRESS, the sync source does not change to ECG when the alarm is silenced, and "- - -" is displayed for PR.

<PR DISPLAY>: Select the pulse rate display on or off. This setting is only available when <SYNC SOURCE> is set to ECG.

<SYNC PITCH>: Select the sync sound pitch.
FIXED: The pitch is fixed to the pitch selected on the SYSTEM SETUP window.
PRESS: The pitch is high when the BP value is above 120 mmHg. The pitch is low when the BP value is below 20 mmHg. The pitch changes in 20 steps from high to low for each 5 mmHg change between 120 and 20 mmHg BP value. The BP value of the highest priority arterial blood pressure is used.
SpO_2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2 connected to the SpO_2 socket.

On the NUMERIC DISPLAY Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
NUMERIC DISPLAY ON HOME SCREEN FOR SpO2
PR
ON
OFF
NUMERIC DISPLAY ON HOME SCREEN FOR SpO2-2
PR
ON
OFF
ΔSpO2
ON
OFF

<NUMERIC DISPLAY ON HOME SCREEN FOR SpO_2>: Select the PR display on or off in the SpO_2 area on the home screen.

<NUMERIC DISPLAY ON HOME SCREEN FOR SpO_2-2>: Select the PR and ΔSpO_2 display on or off in the SpO_2-2 area on the home screen.

SpO_2 with Masimo Probes (AY-631P/AY-633P)

WARNING

SpO_2 measurement may be incorrect in the following cases.

- When the patient's carboxyhemoglobin or methemoglobin increases abnormally.
- When dye is injected in the blood.
- When using an electrosurgical unit.
- During CPR.
- When measuring at a site with venous pulse.
- When there is body movement.
- When the pulse wave is small (insufficient peripheral circulation).

WARNING

To avoid poor circulation, do not wrap the tape too tight. Check the blood circulation condition by observing the skin color and congestion at the skin peripheral to the probe attachment site. Even for short-term monitoring, there may be burn or pressure necrosis from poor blood circulation, especially on neonates or low birth weight infants whose skin is delicate. Accurate measurement cannot be performed on a site with poor peripheral circulation.

WARNING

Check the circulation condition by observing the skin color at the measurement site and pulse waveform. Change the measurement site every 8 hours for disposable probes and every 4 hours for reusable probes. When using the probe on the following patients, take extreme care and change the measurement site more frequently according to symptoms and degree.

- Patient with a fever
- Patient with peripheral circulation insufficiency
- Neonate or low birth weight infant with delicate skin

WARNING

When monitoring SpO_2 of a patient who is receiving photodynamic therapy, the light from the finger probe sensor may cause a burn. Photodynamic therapy uses a photosensitizing agent that has a side effect of photosensitivity.

WARNING

When not monitoring SpO_2, disconnect the SpO_2 connection cord from the input unit. Otherwise, noise from the probe sensor may interfere and incorrect data is displayed on the screen.

CAUTION

The following information are given by Masimo Corporation.

- A pulse oximeter should NOT be used as an apnea monitor.
- A pulse oximeter should be considered as early warning device. As a trend towards patient deoxygenation is indicated, blood sample should be analyzed by a laboratory co-oximeter to completely understand the patient's condition.

CAUTION

Turn off the power of mobile phones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for devices allowed by the hospital administrator). Radio waves from devices such as mobile phones or small wireless devices may be mistaken as pulse waves and the displayed data may be incorrect.

CAUTION

Normal external light does not affect monitoring but strong light such as a surgical light or sunlight may affect monitoring. If affected, cover the measuring site with a blanket.

CAUTION

While a patient is on medication which causes vasodilation, the pulse waveform may change and in rare cases the SpO_2 value might not be displayed.

CAUTION

SpO_2 and pulse rate readings may be inaccurate for a short time after defibrillation when using Masimo probes.

CAUTION

Only use the specified probes. Otherwise, SpO_2 cannot be monitored.

NOTE:

- Purchase of this instrument confers no express or implied license under any Masimo patent to use this instrument with any oximetry sensor that is not manufactured or licensed by Masimo Corporation.
- Do not attach the probe to the same limb that is used for NIBP measurement or an IBP catheter. The SpO_2 measurement may be incorrect.

Silencing SpO_2 Alarm

This function is only available for BSM-6000A series. When the <SILENCE SpO_2 ALARM> on the ALARM window of the SYSTEM SETUP window is set to ON, a second occurring SpO_2 alarm can be silenced when the [Silence Alarms] key is pressed.

NOTE: When the <SILENCE SpO_2 ALARM> is set to ON and the monitored SpO_2 value is close to the SpO_2 upper and lower alarm limit setting, you may have to press the [Silence Alarm] key several times to silence the SpO_2 alarm.

Preparation

Select the appropriate probe according to purpose. To connect a Masimo probe to the SpO_2 socket on the AY-631P or AY-633P input unit, the JL-630P or JL-631P SpO_2 connection cord is required. Use JL-630P with LNOP series probes and JL-631P with LNCS series probes. The Masimo probes are available direct from Masimo or their suppliers.

Monitoring SpO_2 at two sites (dual SpO_2) with Masimo probes are available. To monitor dual SpO_2, the IF-925P communication cable and a Masimo pulse oximeter, Radical™, Radical-7™ or Rad-8™ are required. Connect a Masimo probe to the SpO_2 socket on the AY-631P or AY-633P input unit, another probe to the Masimo pulse oximeter and connect the pulse oximeter to the multi-link socket on the monitor with the IF-925P communication cable.

When Monitoring Dual SpO_2

CAUTION

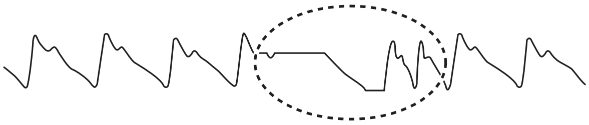
Some pulse oximeter alarms do not function on the bedside monitor when an pulse oximeter is connected. When the data is abnormal, check the alarm on the pulse oximeter.

CAUTION

When two probes are attached too close to each other, the light from the probes interferes with each other and SpO_2 cannot be monitored properly. Make sure that there is no light interference when attaching two probes.

NOTE:

- If a parameter is not monitored on the pulse oximeter, it is not displayed on the bedside monitor.
- Some parameters cannot be displayed on the bedside monitor even if they are monitored on the pulse oximeter.
- Waveforms from the pulse oximeter are not synchronized with the waveforms measured on the bedside monitor.
- When the pulse oximeter is operating in power save mode, the bedside monitor cannot receive data from the pulse oximeter. For details on the power save mode, refer to the pulse oximeter manual.
- The pulse waveform displayed on the bedside monitor is affected by the operation on the pulse oximeter. Depending on the status of the pulse oximeter, the pulse waveform displayed on the bedside monitor may differ from the actual waveform.
  e.g. The pulse waveform on the bedside monitor becomes flat while the trendgraph on the pulse oximeter is updated.



Masimo SpO_2 Probes

LNOP® Reusable Probes

Model	Patient	Weight Range	Measuring Accuracy		Application Site	Qty (/box)
			No Motion	Motion		
LNOP DCI	Adult, pediatric	>30 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNOP DCIP	Pediatric	10 to 50 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNOP YI	Neonate, pediatric, adult	>1 kg	1 to 3 kg: ±3%SpO_2 >3 kg: ±2%SpO_2	1 to 3 kg: ±3%SpO_2 >3 kg: ±3%SpO_2	Multi-site	1
LNOP TC-I	Adult, pediatric	>30 kg	±3.5%SpO_2	N/A	Ear lobe	1
LNOP DC-195	Adult, pediatric	>30 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNOP DCSC	Adult, pediatric	>30 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNOP DC-12	Adult	>30 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNOP TF-I	Adult	>30 kg	±2%SpO_2	N/A	Forehead	1

LNOP® Adhesive Probes

Model	Patient	Weight Range	Measuring Range		Application Site	Qty (/box)
			No Motion	Motion		
LNOP Adt	Adult	>30 kg	±2%SpO_2	±3%SpO_2	Finger	20
LNOP Pdt	Adult, pediatric	10 to 50 kg	±2%SpO_2	±3%SpO_2	Finger	20
LNOP Neo	Neonate	<10 kg	±3%SpO_2	±3%SpO_2	<3 kg: Foot >3 kg: Thumb or great toe	20
LNOP NeoPt	Neonate	<1 kg	±3%SpO_2	±3%SpO_2	Foot	20
LNOP Neo-L	Neonate, pediatric, adult	<3 kg >40 kg	<3 kg: ±3%SpO_2 >40 kg: ±2%SpO_2	<3 kg: ±3%SpO_2 >40 kg: ±3%SpO_2	<3 kg: Foot or toe >40 kg: Finger	20
LNOP NeoPt-L	Neonate	<1 kg	±3%SpO_2	±3%SpO_2	Foot	20
LNOP Inf-L	Neonate, pediatric	3 to 20 kg	±2%SpO_2	±3%SpO_2	Toe	20
LNOP Neo Bridge	Neonate	<10 kg	±3%SpO_2	±3%SpO_2	<3 kg: Foot >3 kg: Thumb or great toe	20
LNOP NeoPt Bridge	Neonate	<1 kg	±3%SpO_2	±3%SpO_2	Foot	20

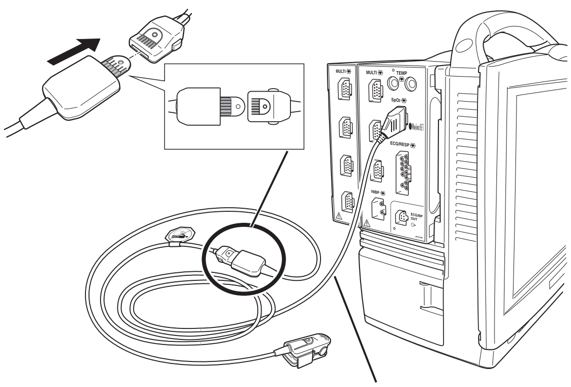
Model	Patient	Weight Range	Measuring Range		Application Site	Qty (/box)
			No Motion	Motion		
LNOP Hi-Fi Trauma Neo/Adult	Adult, neonate	<3 kg >30 kg	<3 kg: ±3%SpO_2 >30 kg: ±2%SpO_2	<3 kg: ±3%SpO_2 >30 kg: ±3%SpO_2	<3 kg: Foot >30 kg: Finger	20
LNOP Hi-Fi Trauma Inf/ Ped	Infant, pediatric	3 to 30 kg	3 to 10 kg: ±3%SpO_2 10 to 30 kg: ±2%SpO_2	3 to 10 kg: ±3%SpO_2 10 to 30 kg: ±3%SpO_2	Finger or toe	20
LNOP Blue Inf	Neonate, pediatric	2.5 to 30 kg	±3 (for 80 to 100%SpO_2) ±4 (for 60 to 80%SpO_2)	N/A	Great toe	20
LNOP Adtx	Adult, pediatric	>30 kg	±2%SpO_2	±3%SpO_2	Finger	20
LNOP Pdtx	Pediatric	10 to 50 kg	±2%SpO_2	±3%SpO_2	Finger	20

LNCS™ Reusable Probes

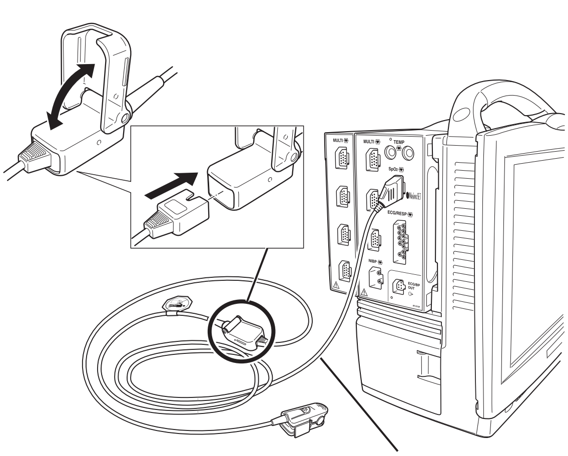
Model	Patient	Weight Range	Measuring Accuracy		Application Site	Qty (/box)
			No Motion	Motion		
LNCS DCI	Adult, pediatric	>30 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNCS DCIP	Pediatric	10 to 50 kg	±2%SpO_2	±3%SpO_2	Finger	1
LNCS TC-I	Adult, pediatric	>30 kg	±3.5%SpO_2	N/A	Ear lobe	1
LNCS TF-I	Adult, pediatric	>30 kg	±2%SpO_2	N/A	Forehead	1

LNCS™ Adhesive Probes

Model	Patient	Weight Range	Measuring Accuracy		Application Site	Qty (/box)
			No Motion	Motion		
LNCS Adtx	Adult, pediatric	>30 kg	±2%SpO_2	±3%SpO_2	Finger	20
LNCS Pdtx	Adult, pediatric	10 to 50 kg	±2%SpO_2	±3%SpO_2	Finger	20
LNCS Inf-L	Neonate, pediatric	3 to 20 kg	±2%SpO_2	±3%SpO_2	Toe	20
LNCS Neo-L	Neonate, pediatric, adult	<3 kg >40 kg	±3%SpO_2 ±2%SpO_2	±3%SpO_2 ±3%SpO_2	<3 kg: Foot or toe >40 kg: Finger	20
LNCS NeoPt	Neonate	<1 kg	±3%SpO_2	±3%SpO_2	Foot	20



When connecting the LNOP series probe



When connecting the LNCS series probe

For details on how to connect a Masimo probe to the Masimo pulse oximeter, refer to the pulse oximeter manual. To connect the pulse oximeter to the multi-link socket on the monitor, refer to the IF-925P communication cable operator’s manual.

WARNING

Do not use additional tape to secure the probe to patient.

CAUTION

When the probe is attached on an appropriate site with sufficient circulation and an error message about probe attachment repeatedly appears, the probe may be deteriorated. Replace it with a new one.

CAUTION

If the attachment site is dirty with blood or bodily fluids, clean the attachment site before attaching the probe. If there is nail polish on the attachment site, remove the polish. Otherwise, the amount of transmitted light decreases, and measured value may be incorrect or measurement cannot be performed.

CAUTION

Only use the specified probes. Otherwise, SpO_2 cannot be monitored.

CAUTION

When a message indicates a faulty probe or faulty SpO_2 connection cord, stop monitoring and replace the probe or SpO_2 connection cord with a new one.

CAUTION

- Do not reuse adhesive probes for another patients because it causes cross infection.
- Do not use the probe over its stated lifetime. Otherwise the SpO_2 measurement accuracy cannot be guaranteed.
- Do not immerse the Masimo probe in water or any other solutions. The probe, cable and connectors are not waterproof.
- Do not sterilize the probe by irradiation, steam or ethylene oxide. Refer to the probe manual.

NOTE:

- In order to maintain sufficient blood circulation, keep the measurement site warm by covering with a blanket or something similar. Warming the site is effective, especially for a patient with a small pulse amplitude.
- Connect the probe and SpO_2 connection cord until you hear a stopper of the SpO_2 connection cord click.
- When using Masimo probes, read the instructions provided with the probe.

Changing SpO_2 Settings

Change settings on the SpO_2 window. The following settings can be changed on the SpO_2 tab for SpO_2 monitoring.

- Pulse waveform sensitivity
- SpO_2 and pulse rate alarm limits
- Averaging time
- Sensitivity mode
- FAST SAT mode on or off
- Display pulse rate and/or perfusion index in SpO_2 numeric data area on the home screen

The following settings can be changed on the SpO_2-2 tab for dual SpO_2 monitoring.

- Pulse waveform sensitivity
- ΔSpO_2 alarm limit
- Scale for SpO_2-2 trendgraph on the home screen
- Display SpO_2-2 pulse rate, perfusion index and/or ΔSpO_2 in SpO_2-2 numeric data area on the home screen

The following settings are common settings for SpO_2 and SpO_2-2.

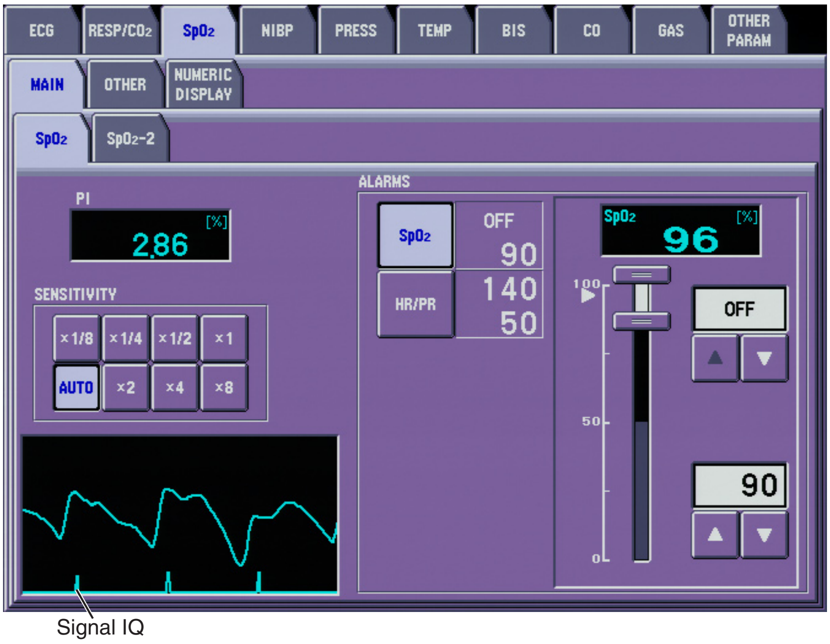
- Sync source
- Sync sound pitch

The SpO_2 data display color can be set on the SYSTEM SETUP window.

The scale of the SpO_2 trendgraph on the home screen is the same scale as the trendgraph of the Review window.

The SpO_2 pulse waveform sweep speed is the speed set for <SWEEP SPEED> on the WAVES page of the DISPLAY window.

On the MAIN Page



SpO_2 Tab

<SENSITIVITY>: Select sensitivity for pulse waveform on the home screen.

NOTE:

The pulse wave amplitude varies according to pulsation component ratio of whole transmitted IR signal. When the pulsation component ratio is 1%, the pulse wave amplitude becomes about 10 mm at ×1 setting on the display.

<ALARMS>

SpO_2 alarm limits: Set the upper and lower SpO_2 alarm limits.

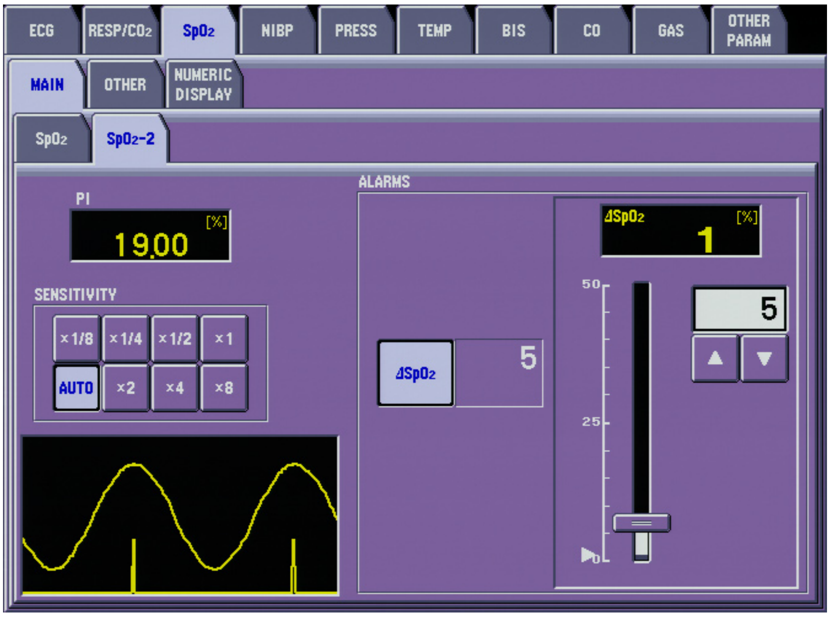
HR/PR alarm limits: Set the upper and lower heart rate or pulse rate alarm limits.

Signal IQ

Signal IQ is the signal quality indicator. Signal IQ can be used to identify the occurrence of a patient's pulse and the associated signal quality of the measurement. The pulse waveform is often distorted when there is motion and may be obscured by artifact. The Signal IQ, shown as a vertical line, coincides with the peak of an arterial pulsation. The height of the vertical line of the Signal IQ indicates the quality of the measured signal. The taller the height, the higher the signal quality. When the signal quality is very low, the height of the vertical line becomes low and "LOW QUALITY SIGNAL" message is displayed on the screen.

PI (Perfusion Index)

The Perfusion Index indicates the percentage of pulsatile signal to non-pulsatile signal. The range of Perfusion Index is 0.02% (very weak pulse strength) to 20% (very strong pulse strength). The Perfusion Index allows clinicians to place sensors on optimal sites. Placing the sensor at the site with the highest Perfusion Index number improves performance during motion.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SpO2
SpO2-2
PI
[%]
19.00
SENSITIVITY
×1/8
×1/4
×1/2
×1
AUTO
×2
×4
×8
ALARMS
ΔSpO2
5
ΔSpO2
[%]
1
50
25
5
▲
▼
OFF

SpO$_2$-2 Tab

<SENSITIVITY>: Select sensitivity for SpO$_2$-2 pulse waveform on the home screen.

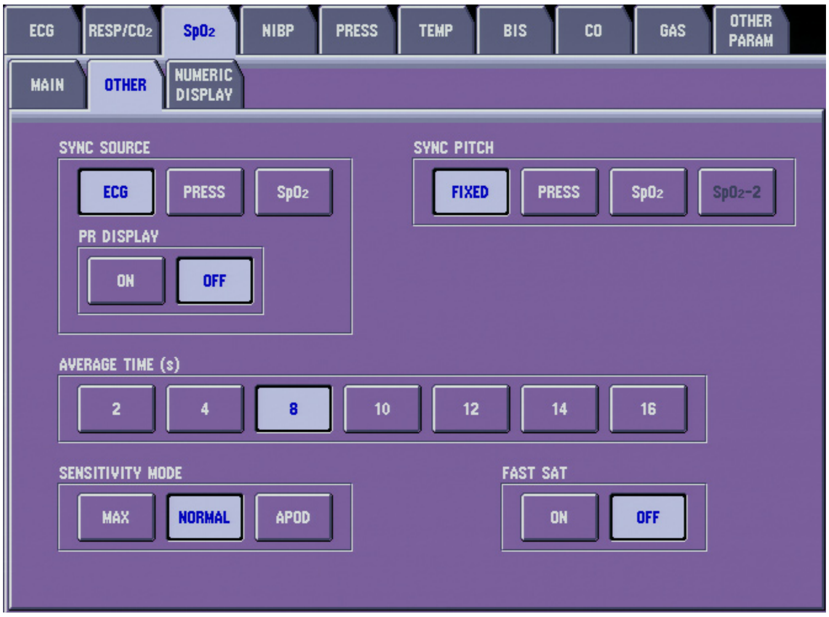
NOTE:

The pulse wave amplitude varies according to pulsation component ratio of whole transmitted IR signal. When the pulsation component ratio is 1%, the pulse wave amplitude becomes about 10 mm at ×1 setting on the display.

<ALARMS>

ΔSpO$_2$ alarm limit: Set the upper ΔSpO$_2$ alarm limit.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
SYNC SOURCE
ECG
PRESS
SpO2
PR DISPLAY
ON
OFF
SYNC PITCH
FIXED
PRESS
SpO2
SpO2-2
AVERAGE TIME (s)
2
4
8
10
12
14
16
SENSITIVITY MODE
MAX
NORMAL
APOD
FAST SAT
ON
OFF

<SYNC SOURCE>: Select the sync sound source from ECG (heart rate), SpO$_2$ and arterial blood pressure (IBP).

NOTE:

- When heart rate is unstable because of an ESU, select SpO$_2$ or PRESS.
- When the connection cord of SpO$_2$ or IBP of the arterial blood pressure is disconnected from the monitor and an alarm occurs when the sync source is set to SpO$_2$ or PRESS, the sync source changes to ECG when the alarm is silenced by pressing the [SILENCE ALARMS] key. The sync source returns to SpO$_2$ or PRESS when the SpO$_2$ or IBP is monitored again. When using IBP as the sync source, adjust zero balance.
- When the sensor is detached from the patient and alarm occurs, and the sync source is set to SpO$_2$ or PRESS, the sync source does not change to ECG when the alarm is silenced, and “- - -” is displayed for PR.

<PR DISPLAY>: Select the pulse rate display on or off. This setting is only available when <SYNC SOURCE> is set to ECG.

<SYNC PITCH>: Select the sync sound pitch.

FIXED: The pitch is fixed to the pitch selected on the SYSTEM SETUP window.

PRESS: The pitch is high when the BP value is above 120 mmHg. The pitch is low when the BP value is below 20 mmHg. The pitch changes in 20 steps from high to low for each 5 mmHg change between 120 and 20 mmHg BP value. The BP value of the highest priority arterial blood pressure is used.

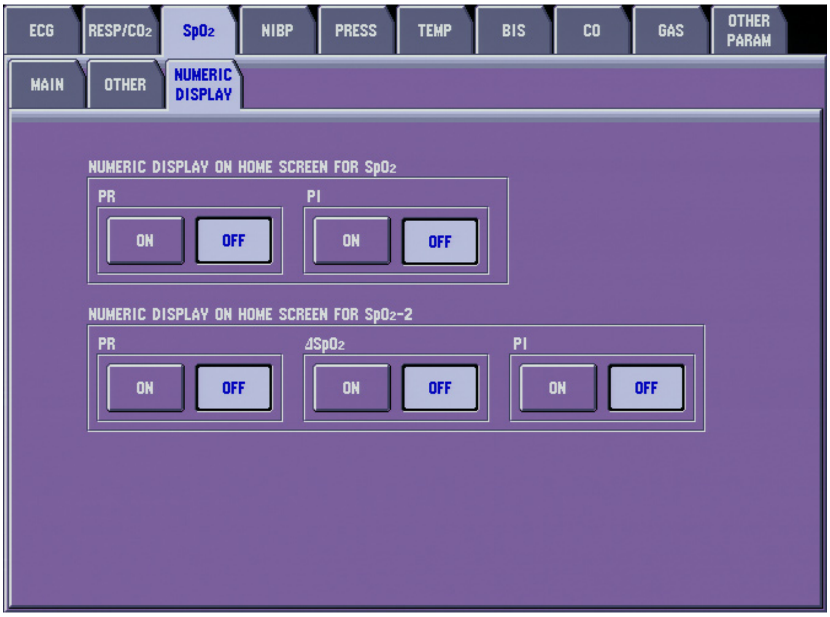
SpO$_2$: The pitch changes in 20 steps from high to low for each 1%SpO$_2$ change between 100%SpO$_2$ and 81%SpO$_2$ in SpO$_2$ value of SpO$_2$ connected to the SpO$_2$ socket.

<AVERAGE TIME (s)>: Select the averaging time.

<SENSITIVITY MODE>: Select the sensitivity mode.
MAX: This mode should be used for a critical patient, where obtaining a reading is most difficult. MAX mode is designed to interpret and display data for even the weakest of signals. This mode is recommended during procedures and when clinician and patient contact is continuous.
NORMAL: This mode provides the best combination of sensitivity and probe-off detection performance. This mode is recommended for most patients.
APOD: APOD (Adaptive Probe Off Detection) is the least sensitive in picking up a reading on patients with low perfusion but has the best detection for probe-off conditions. This mode is useful for patients that are at particular risk of the sensor becoming detached (pediatric, body movement, etc.).

<FAST SAT>: FAST SAT enables rapid tracking of arterial oxygen saturation changes by minimizing the averaging. This mode is clinically applicable during procedures when detecting rapid changes in oxygen saturation is most important such as induction, intubation and sleep studies.

On the NUMERIC DISPLAY Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
OTHER
NUMERIC DISPLAY
NUMERIC DISPLAY ON HOME SCREEN FOR SpO2
PR
ON
OFF
PI
ON
OFF
NUMERIC DISPLAY ON HOME SCREEN FOR SpO2-2
PR
ON
OFF
ΔSpO2
ON
OFF
PI
ON
OFF

<NUMERIC DISPLAY ON HOME SCREEN FOR SpO$_2$>: Select the PR and PI (Perfusion Index) display on or off in the SpO$_2$ area on the home screen.

<NUMERIC DISPLAY ON HOME SCREEN FOR SpO$_2$-2>: Select the PR, ΔSpO$_2$ and PI (Perfusion Index) display on or off in the SpO$_2$-2 area on the home screen.

NIBP

The NIBP measurement can be used during electrosurgery and during the discharge of a cardiac defibrillator. This monitor complies with IEC 60601-2-30: 1999.

WARNING

Be careful when measuring NIBP on a patient with known bleeding disorders or coagulation. After NIBP measurement, there may be dot hemorrhage, or circulatory disorder by thrombus where the cuff is attached.

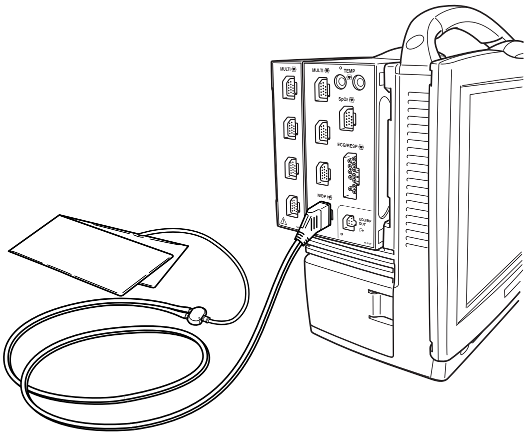
WARNING

NIBP measurement may be incorrect in the following cases.

- When using an electrosurgical unit
- When there is body movement
- When the pulse wave is small (insufficient peripheral circulation)
- Too many arrhythmias
- When there is vibration
- When there is a rapid blood pressure change
- During CPR

Preparation

Select the appropriate cuff according to the patient. A YN-900P (1.5 m) or YN-901P (3.5 m) air hose is required. A YN-990P (1.5 m) extension hose is also available. When using cuff for neonates, a YN-920P (1.5 m) or YN-921P (3.5 m) air hose is required.



When connecting the YP-963P Cuff for Adults

Reusable Cuffs

Cuff			Width (cm)	Applicable Circumference (cm)
For infants		YP-960T	5	8 to 13
For children	Small	YP-961T	7	12 to 18
	Standard	YP-702T	10	15 to 23
		YP-962T		
For adults	Standard	YP-703T	13	21 to 30
		YP-963T		
	Large	YP-964T	15	26 to 36
For thigh		YP-965T	19	33 to 45

Disposable Cuffs

Cuff		Width (cm)	Applicable Circumference (cm)
Infants (Non-sterilized)	YP-810P	6	8 to 14
Children (Non-sterilized)	YP-811P	8	13 to 20

Cuff			Width (cm)	Applicable Circumference (cm)
Adults (Non-sterilized)	Small	YP-812P	10	18 to 26
	Standard	YP-813P	14	26 to 35
	Medium large	YP-814P	15	29 to 38
	Large	YP-815P	17	32 to 42
	Extra large	YP-816P	18	35 to 44
For thigh		YP-817P	20	42 to 50
Neonates (Non-sterilized)		YP-820P	2	3 to 6
		YP-821P	3	4 to 8
		YP-822P	4	6 to 10
		YP-823P	4.5	7 to 13
		YP-824P	5	8 to 15
Neonates (Sterilized)		No. 11*	3	5 to 7.5
		No. 12*	4	7.5 to 10.5
		No. 13*	5	8.5 to 13

* These parts have not been checked for compliance with the MDD (Medical Device Directive). For EC member countries, Nihon Kohden recommends the use of parts that comply with MDD.

Connect the air hose to the NIBP socket on the input unit.

CAUTION

Firmly connect the air hose to the NIBP socket on the monitor until it clicks. If not connected properly, the cuff type cannot be identified. Check that the cuff type is correctly identified on the monitoring screen.

CAUTION

When too much pressure is applied to the cuff, or the hose is bent or squeezed, the “NIBP SAFETY CIRCUIT RUNNING” message appears on the screen and NIBP monitoring may be stopped. Remove the cause, wait 40 seconds, check that the message disappears, then measure again.

CAUTION

Do not wrap the cuff too tight. It may cause poor blood circulation and congestion. If the cuff is wrapped too loosely, the NIBP value may increase.

CAUTION

Do not wrap the cuff on an arm or thigh which is used for injection. NIBP measurement on an arm or thigh which is used for injection may cause reflux of blood and stop injection.

CAUTION

Only connect the air hose to the cuff and NIBP socket on the monitor. Do not connect the air hose, especially the air hose for neonate, to other parts, such as an infusion line. It may cause thrombus.

Changing NIBP Settings

Change settings on the NIBP window. The following settings can be changed for monitoring NIBP.

- Initial cuff inflation pressure
- Measurement mode and interval
- NIBP alarm limits
- Automatic measurement with PWTT on/off and trigger threshold

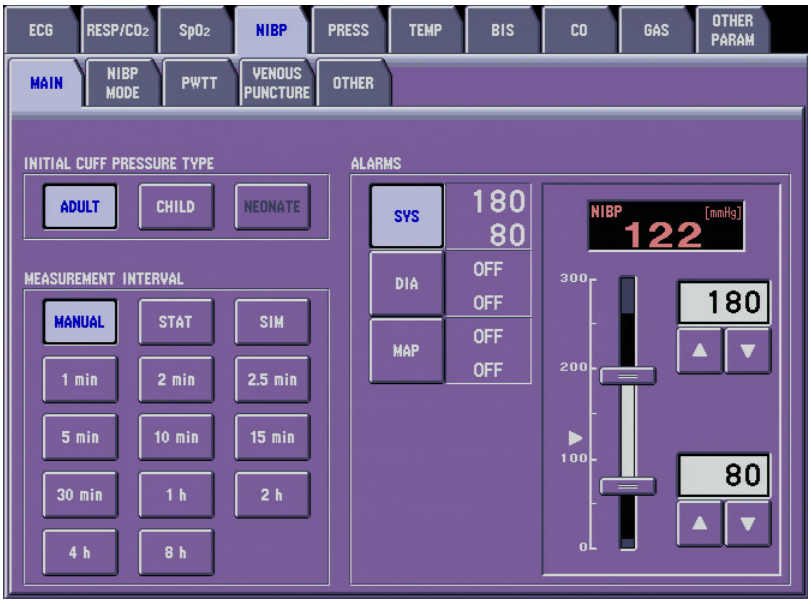
The following items can be set on the SYSTEM SETUP window.

- Measurement end sound on or off
- Starting NIBP auto measurement by pressing the [NIBP Interval] key
- SIM mode measurement on or off
- Measurement mode after the monitor power is off for more than 30 minutes or the monitor is initialized
- Dim or hide the old measurement data
- Time after NIBP measurement for the NIBP data to be dimmed or hidden
- Measurement program for STAT and SIM modes
- Measurement interval displayed on the NIBP INTERVALS window when the [NIBP Interval] key is pressed
- Venous puncture mode on or off and cuff inflation pressure for venous puncture
- NIBP data display color

The NIBP unit (mmHg or kPa) is the same as the blood pressure unit. The pressure unit is set on the SYSTEM CONFIGURATION screen.

The scale of the NIBP trendgraph on the home screen is the same scale as the trendgraph of the Review window.

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
NIBP MODE
PWTT
VENOUS PUNCTURE
OTHER
INITIAL CUFF PRESSURE TYPE
ADULT
CHILD
NEONATE
MEASUREMENT INTERVAL
MANUAL
STAT
SIM
1 min
2 min
2.5 min
5 min
10 min
15 min
30 min
1 h
2 h
4 h
8 h
ALARMS
SYS
180
80
DIA
OFF
OFF
MAP
OFF
OFF
NIBP
[mmHg]
122
300
200
100
0
180
80

<INITIAL CUFF PRESSURE TYPE>: Select the initial cuff inflation pressure type when the air hose for adult/child/neonate is connected to the NIBP socket.

<ALARMS>

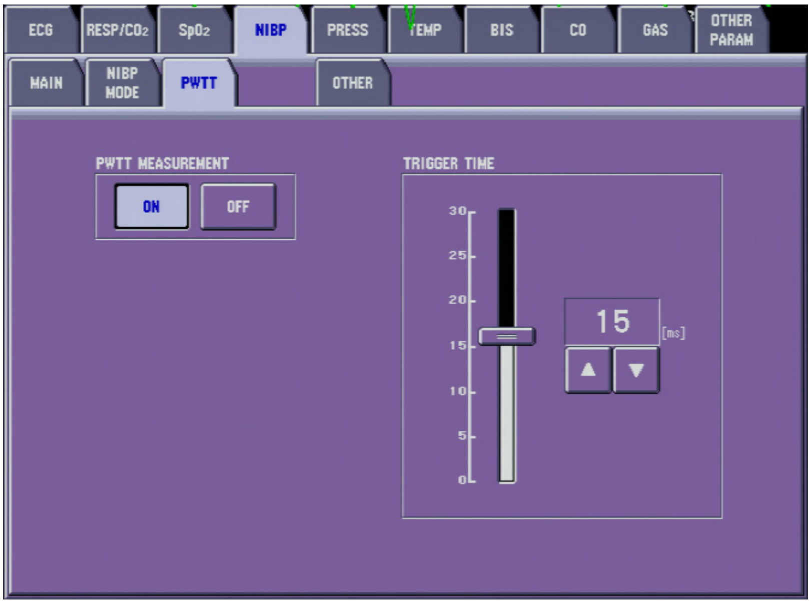
SYS alarm limits: Set the upper and lower systolic alarm limits.

DIA alarm limits: Set the upper and lower diastolic alarm limits.

MAP alarm limits: Set the upper and lower mean alarm limits.

<MEASUREMENT INTERVAL>: Select the NIBP measurement mode.

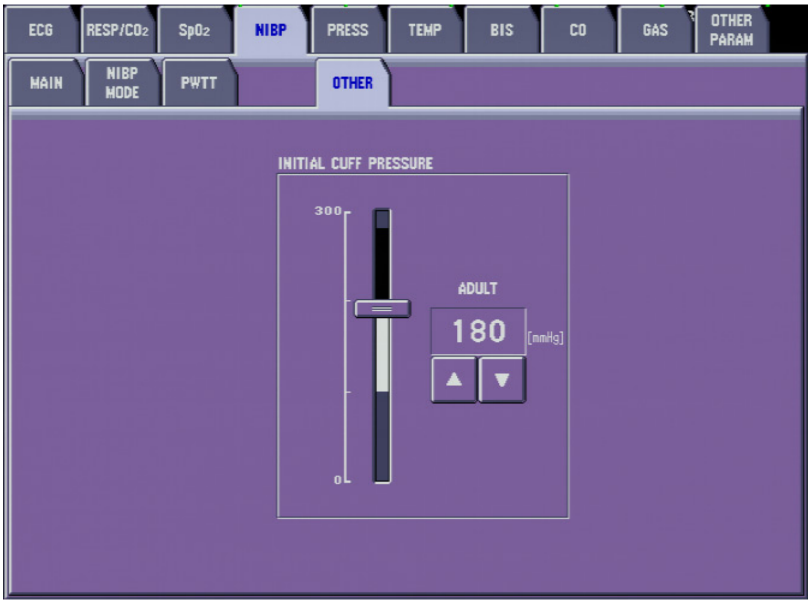
On the PWTT Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
NIBP MODE
PWTT
OTHER
PWTT MEASUREMENT
ON
OFF
TRIGGER TIME
30
25
20
15
10
5
0
15
[ms]
▲
▼

To automatically measure NIBP with PWTT, select ON for <PWTT MEASUREMENT> and set the delta PWTT threshold in <TRIGGER TIME> box.

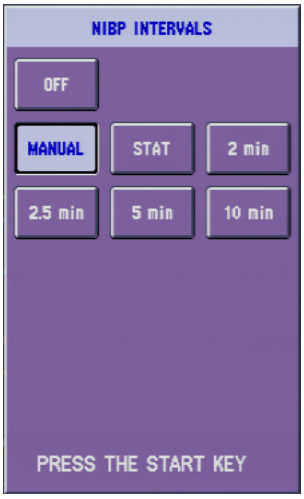
NOTE: PWTT is only available on the AY-660P, AY-661P, AY-663P, AY-671P or AY-673P input unit and SpO_2 is monitored with Nihon Kohden probe.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
NIBP MODE
PWTT
OTHER
INITIAL CUFF PRESSURE
300
0
ADULT
180
[mmHg]
▲
▼

<INITIAL CUFF PRESSURE>: Select the cuff inflation pressure for the first measurement. After the first measurement, the cuff inflation pressure is the systolic value of the previous measurement plus 30 mmHg.
To change the initial cuff inflation pressure for neonate, the air hose for neonate must be connected to the NIBP socket on the input unit.

On the INTERVAL Page


NIBP INTERVALS
OFF
MANUAL
STAT
2 min
2.5 min
5 min
10 min
PRESS THE START KEY

Select the measurement modes for the mode selection by the [NIBP Interval] key on the bedside monitor.

The SIM mode is only available in the OR site and when <SIM> on the NIBP page of the PARAMETERS window is set to ON in the SYSTEM SETUP window.

Starting and Stopping NIBP Measurement

After selecting measurement mode and interval, press the [NIBP Start/Stop] key on the bedside monitor.

To stop measurement, press the [NIBP Start/Stop] key again.

WARNING

When performing long term measurement at intervals less than 2.5 minutes, perform measurements while observing the state of the patient, blood vessels and limb to ensure adequate circulation. Congestion may occur at the measurement site. When performing periodic measurement for a long time, periodically check the circulation condition.

CAUTION

When too much pressure is applied to the cuff, or the hose is bent or squeezed, the "NIBP SAFETY CIRCUIT RUNNING" message appears on the screen and NIBP monitoring may be stopped. Remove the cause, wait 40 seconds, check that the message disappears, then measure again.

CAUTION

Before starting STAT or SIM mode measurement, check the measurement setting (measurement intervals).

NOTE:

- When measuring patients who are conscious, help the patient to relax. Measurement may not be accurate if the patient's arm is tense or if the patient talks.
- The data for measurement on the thigh tends to be higher than measurement on the arm.
- Do not apply pressure to the cuff or air hose. NIBP might not be measured correctly because of the noise or NIBP measurement may stop due to the NIBP safety circuit running.
- Do not bend or apply pressure on the air hose. It may cause noise and NIBP might not be measured correctly.
- When NIBP START/STOP key is assigned to the function key, the NIBP measurement can also be performed with the function key.
- Do not measure NIBP on a patient on whom an IABP is used. Accurate NIBP measurement cannot be performed due to pulse waves from the IABP mixing with the patient's pulse waves.

Measurement Mode and Interval

There are four NIBP measurement modes: manual, auto (periodic), STAT (continuous) and SIM. The SIM mode is only available in OR site and when <SIM> is set to ON on the NIBP page of the PARAMETERS window in the SYSTEM SETUP window.

Manual Measurement

NIBP is measured once whenever the [NIBP Start/Stop] key on the monitor is pressed. Manual measurement cannot be performed during the first stage of the STAT or SIM mode measurement.

Auto Measurement

The first NIBP measurement is performed when the [NIBP Start/Stop] key on the monitor is pressed. The second measurement is performed when the current time (minutes) in the monitor reaches the nearest time interval selected.

Auto Measurement with PWTT

NOTE: PWTT is only available on the AY-660P, AY-661P, AY-663P, AY-671P or AY-673P input unit and SpO_2 is monitored with Nihon Kohden probe.

When <PWTT MEASUREMENT> is set to ON and trigger threshold is set on the PWTT page, NIBP is automatically measured when the PWTT exceeds the threshold.

CAUTION

Do not rely only on the PWTT to monitor blood pressure changes. When it is necessary to monitor critical blood pressure change, set the appropriate interval for NIBP measurement.

CAUTION

- Do not measure NIBP with PWTT on a neonate because circulation of a neonate changes rapidly.
- In the following cases, PWTT may trigger too many or no NIBP measurements. Check the patient condition. If necessary, change the delta PWTT threshold or set the PWTT to OFF.
  - Rapid blood pressure change with vasoreflex due to vasoactive drugs, such as phenylephrine and nicardipine
  - Unstable pulse wave due to poor peripheral circulation
  - Too many arrhythmias
  - Patient movement
  - Noise on ECG due to ESU
  - SpO_2 measurement on foot of a child

NOTE:

- NIBP measurement with PWTT can only be performed when the NIBP measurement mode is set to one of the intervals.
- NIBP measurement with PWTT is performed when ECG and SpO_2 are monitored. When ECG or SpO_2 is not monitored, delta PWTT appears blank on the home screen.
- When the delta PWTT threshold is too short for a patient, NIBP measurement may be performed too frequently. If this occurs, change the delta PWTT threshold to a longer time.
- The PWTT may be incorrect when there is too much arrhythmia or noise.
- NIBP is not measured within one minute of automatic NIBP measurement even if delta PWTT exceeds the threshold.
- When using PWTT for NIBP measurement during operation, set arrhythmia analysis on the ECG window to on. If set to off, the PWTT may be incorrect due to ESU.
- When changing the ECG lead, the baseline of PWTT is reset and PWTT may be discontinuous.

STAT Measurement

Measurements are performed continuously according to the measurement program set for STAT measurement on the STAT page on the NIBP MODE page of the PARAMETERS window in the SYSTEM SETUP window. The program is divided into two stages. In the first stage, NIBP is measured continuously or at 1 minute intervals for 5 or 10 minutes. In the second stage, NIBP is measured at a different interval (manual or 1, 2, 2.5, 5, 10, 15, 30 minutes, usually, longer interval than the first stage). Manual measurement cannot be performed during first stage measurement.

SIM Mode Measurement

CAUTION

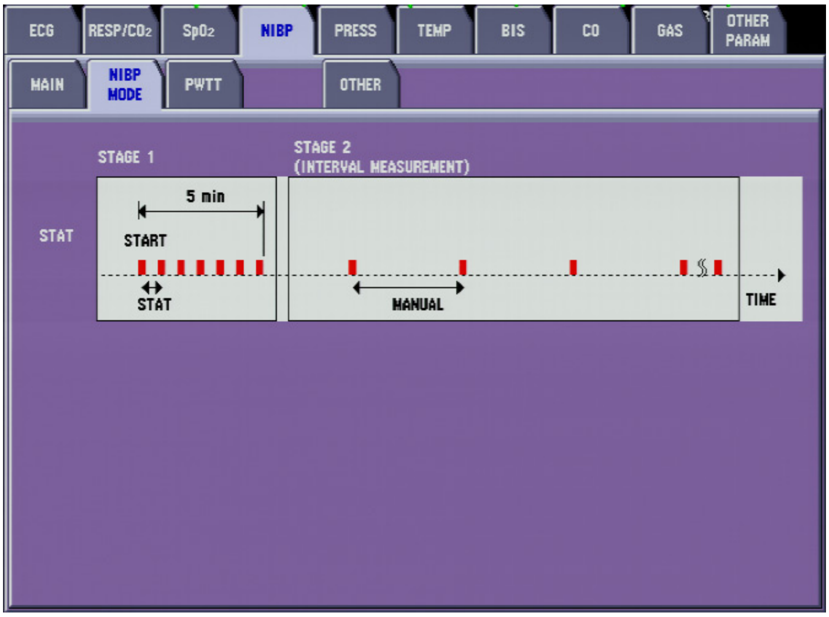
For safety during lumbar anesthesia, NIBP SIM mode measurement is recommended by medical policy in Japan and the factory default settings are the recommended settings. When changing these initial settings, make sure that the changed setting is appropriate for the patient by referring to the manual of the anesthetic agent.

SIM mode program is for monitoring blood pressure during regional anesthesia, such as lumbar block, subarachnoid block and epidual anesthesia. The SIM mode is only available in OR site and when <SIM> on the NIBP page of the PARAMETERS window in the SYSTEM SETUP window is set to ON.

Measurements are performed continuously according to the measurement program set for SIM measurement on the SIM tab of the NIBP MODE page of the PARAMETERS window in the SYSTEM SETUP window.

The program is divided into two stages. In the first stage, NIBP is measured at 1, 2 or 2.5 minute intervals for 5, 10 or 15 minutes. In the second stage, NIBP is measured at a different interval (2, 2.5 or 5 minutes, usually longer interval than the first stage). Manual measurement cannot be performed during first stage measurement.

On the NIBP MODE Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
NIBP MODE
PWTT
OTHER
STAGE 1
STAGE 2 (INTERVAL MEASUREMENT)
STAT
5 min
START
STAT
MANUAL
TIME

The measurement settings for STAT and SIM modes can be checked on the NIBP MODE window.

VENOUS PUNCTURE MODE

CAUTION

Do not perform a venous puncture on the same arm where NIBP is measured. This may cause an infusion backflow or internal hemorrhage at the puncture.

To aid in inserting a venous line, you can use venous puncture mode to inflates the cuff to a target pressure in order to prevent venous backflow. Venous backflow causes swelling of the veins and makes it difficult to insert a venous line.

In the venous puncture mode, the cuff automatically deflates 2 minutes after inflation in ADULT/CHILD mode or 70 seconds after inflation in NEONATE mode.

Touch the START key on the VENOUS PUNCTURE page. To stop the cuff inflation, touch the STOP key or do any of the following:

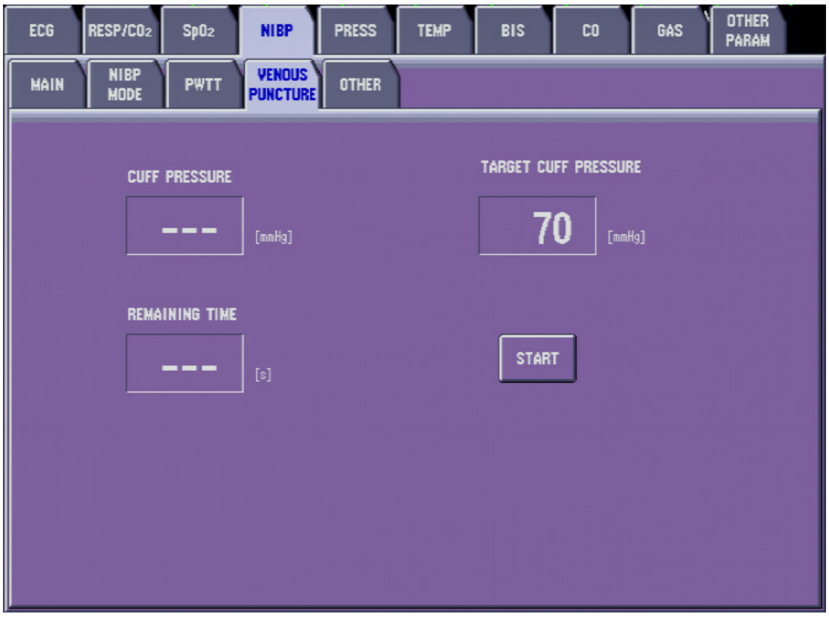
- Display another window.
- Press the [Home] key.
- Touch the waveforms or current trendgraphs display area on the home screen.

To use venous puncture mode, <VENOUS PUNCTURE> must be set to ON and <TARGET CUFF PRESSURE> must be set on the SYSTEM SETUP window.

NOTE: Venous puncture mode is available in the following modes:

- Manual measurement mode
- STAT (continuous) measurement mode (not available during measurement)
- Auto (periodic) measurement mode (not available during measurement and not available when waiting for next measurement)
- SIM measurement mode (Not available during measurement and not available when waiting for next measurement)

VENOUS PUNCTURE Page



CUFF PRESSURE --- [mmHg]

TARGET CUFF PRESSURE 70 [mmHg]

REMAINING TIME --- [s]

CUFF PRESSURE: Displays the current cuff pressure (mmHg).
TARGET CUFF PRESSURE: Displays the set target cuff pressure (mmHg).
REMAINING TIME: Displays the remaining time (s) until cuff deflation.

IBP

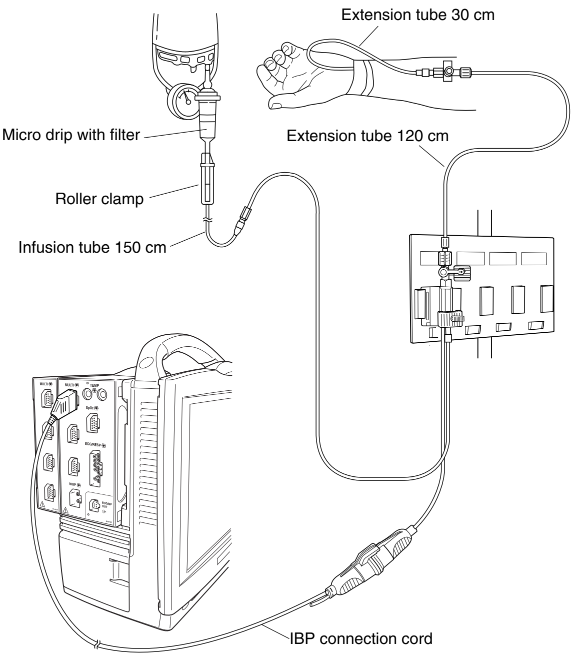
Invasive blood pressure and intracranial pressure (ICP) are measured and monitored by installing the blood pressure measuring device, connecting the blood pressure transducer to the IBP connection cord and IBP connection cord to the MULTI socket or PRESS CO_2 socket on the unit. Up to 7 channels can be monitored. When the ZS-900P transmitter is connected to the bedside monitor and an AY-633P, AY-653P, AY-663P or AY-673P input unit with three MULTI sockets is used for IBP monitoring, only the IBP information from the two sockets from the top can be sent.

NOTE: ZS-900P transmitter is not available for BSM-6000A series.

Preparation

Select the appropriate blood pressure measuring device according to the purpose. The following illustrates a typical blood pressure measuring device setup, the DX-360 Becton Dickinson disposable blood pressure transducer. For details, refer to the instruction manual of the measuring kit. When using other blood pressure transducers and measuring kits, refer to the respective instruction manuals.

.



WARNING

All parts, except for transducers, must be non conductive. Otherwise, the discharged energy may cause electrical shock to the operator during defibrillation.

IBP Connection Cords

The following IBP connection cords are available for connecting the device to the monitor.

JP-900P: For Becton Dickinson blood pressure transducers
JP-920P: For Edwards Lifesciences (Baxter) blood pressure transducers
JP-960P: For Biosensor blood pressure transducers
JP-910P: For other blood pressure transducers

Connecting Cables to the Unit

1. Connect the blood pressure transducer to the IBP connection cord.

2. Connect the IBP connection cord to the MULTI socket on the unit.

NOTE:

- When using an IBP waveform as a synchronization signal for other equipment, connect the IBP line to the MULTI socket on the input unit. The IBP waveform that is used for the synchronization signal depends on the “IBP ANALOG OUT” setting in the SYSTEM SETUP window.
  - When “IBP ANALOG OUT” is set to “FIXED POSITION”:
    The IBP line connected to the top MULTI socket on the input unit is used.
  - When “IBP ANALOG OUT” is set to “HIGHEST PRIORITY LABEL” :
    When more than one IBP waveform is acquired, the IBP waveform of the highest priority label is used.
    IBP label priority:
    ART > ART2 > RAD > DORS > AO > FEM > UA > LVP > P1 > P2 > P3 > P4 > P5 > P6 > P7

- When connecting the IBP connection cord to the unit after assembling the transducer and filling the tubes with saline solutions, make sure that the connector is not wet.

Assembling the Transducer

NOTE:

- The DX series disposable transducers are sterilized by EOG. Keep them clean after opening.
- Check that connectors and caps are firmly connected and the 3-way stopcock are directed to the correct way.
- The 3-way stopcocks and blood pressure tube openings are protected from contamination by the white aerated caps. Keep these white caps on until the solution is filled in completely. After filling the solution, replace the white caps with the yellow sealing caps which are in the separate bag.

1. Inject 1 to 2 units of heparin into 1 mL sterilized physiological saline solution.
   NOTE: Do not mix the solution yet.

2. Insert the needle at the tip of the micro-drip into the hole on the physiological saline pack.

3. Pressurize the physiological saline pack with your hand by pressing the flush cap to remove air from the pack.

4. When the solution in the micro-drip chamber is about 1/3 full (the stainless needle is in the solution), turn the physiological saline pack upside down and mix the physiological saline solution and heparin.

5. Place the saline pack in the pressure bag and hang the pressure bag on the stand.

6. Press the flush cap to completely fill the tube with saline solution.
   NOTE: Tap the bottom part of the micro-drip to remove air bubbles from under the filter.

7. Fill in the transducer with the saline solution. Remove air bubbles by pressing the flush cap at above the saline pack, then bringing the flush cap down.
   If the air bubbles cannot be removed from the transducer:
   i) Hold the transducer higher than the saline pack to flow the saline solution back into the saline pack and fill the transducer again.
   ii) Tap the transducer lightly and flush the transducer slowly. Do not tap too hard because the air bubbles may break into small bubbles which are difficult to remove.
   iii) Check that there are no air bubbles in the transducer, tubes and 3-way stopcocks.

8. Replace the white aerated caps with the yellow sealing caps.

9. Pressurize the pressure bag to 300 mmHg (40.0 kPa). The solution in the micro-chip chamber is about a third to half full.
   At this pressure, the drip rate should be 2 to 4 drops/min.

10. Check all connections and that there is no leakage in the circuit.

11. After about 30 minutes, check the pressure of the pressure bag and drip rate. Also check that there is no leakage in the circuit.

Adjusting Zero Balance

NOTE: There is no alarm for 30 seconds after adjusting zero balance. When the measurement value is abnormal, the numeric value on the screen is highlighted.

Adjust zero balance in the following cases. Zero balance adjustment is important for accurate IBP measurement.

- Before starting measurement
- When the patient moved so that the height of the heart changed
- When the height of the blood pressure transducer changes
- When changes in the measured value are expected due to measurements over a long period of time or due to changes in the ambient temperature (check the pressure when exposed to air)
- IBP connection cord or transducer is changed

When the zero balance is not adjusted, the “ZERO IMBALANCE” message is displayed beside each IBP value.

Zero Balance Mode

There are two modes for adjusting zero balance.

- **All zero**

  Zero balance of all blood pressure lines exposed to air, except for ICP, is performed at the same time. Touch the ZERO ALL key on the PRESS window. The zero all function can also be assigned to one of the function keys.

  Adjust zero balance separately for ICP (intracranial pressure).

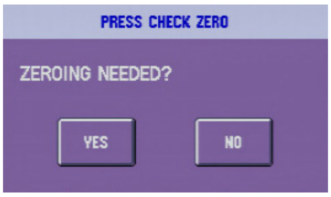
- **Individual zero**

  The zero balance is adjusted individually for one pressure line.
  Touch the ZERO CAL key on the PRESS window of the IBP label (including the ICP label).

  When using the optional JP-940P IBP connection box, the zero balance keys on the box can be used for each line.

Adjusting Zero Balance

1. When zero balance is not adjusted, the following dialog box appears.



PRESS CHECK ZERO

ZEROING NEEDED?

2. Touch the YES key to adjust zero balance. When the YES key is touched, the MAIN page of the PRESS window appears. Adjust zero balance by doing the following steps.

   When the NO key is touched, the monitor starts monitoring IBP by using the zero balance value memorized in the connector of the IBP connection cord and the “ZERO IMBALANCE” messages disappear. The IBP values appear on the screen. If necessary, adjust zero balance by doing the following steps.

3. Move the dome up or down to the appropriate position.

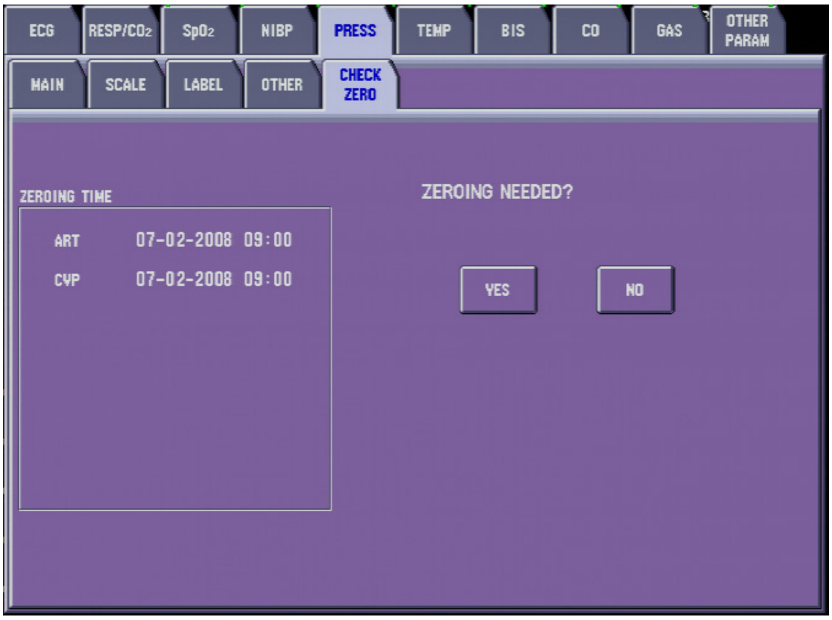
4. To adjust zero balance of all blood pressure lines at the same time
   NOTE: Zero balance cannot be adjusted for ICP by using the zero all function. Adjust zero balance separately from the ICP window.
   Touch the ZERO ALL function key on the home screen or the ZERO ALL key on the MAIN page of the PRESS window.
   To adjust zero balance individually
   Touch the ZERO CAL key on the desired LABEL page of the PRESS window.

   When the "ZEROING COMPLETE" message is displayed, zero balance adjustment is completed.

5. Close the 3-way stopcock.

The CHECK ZERO Page

This page becomes active when zero balance is not adjusted. Zero balance can also be adjusted on the CHECK ZERO page.



ZEROING TIME
ART 07-02-2008 09:00
CVP 07-02-2008 09:00

Changing IBP Settings

Change settings on the PRESS window. The following settings can be changed for monitoring IBP.

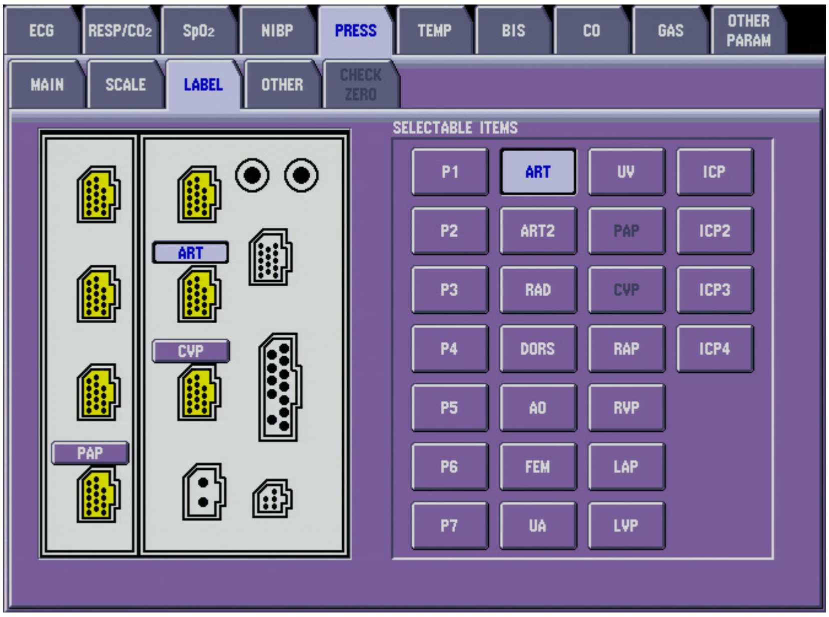
- Label
- Scale
- IBP alarm limits
- Adjust zero balance. Refer to the "Adjusting Zero Balance" section.
- IBP calculation mode
- Numeric data display mode
- CPP display on or off
- Sync source
- Sync sound pitch
- Pulse rate display on or off
- Waveform display mode (scale mode)
- PPV/SPV display on or off
- PPV/SPV average time

The blood pressure unit (mmHg or kPa) can be set on the SYSTEM CONFIGURATION screen.

The noise filter and IBP data display color can be set on the SYSTEM SETUP window.

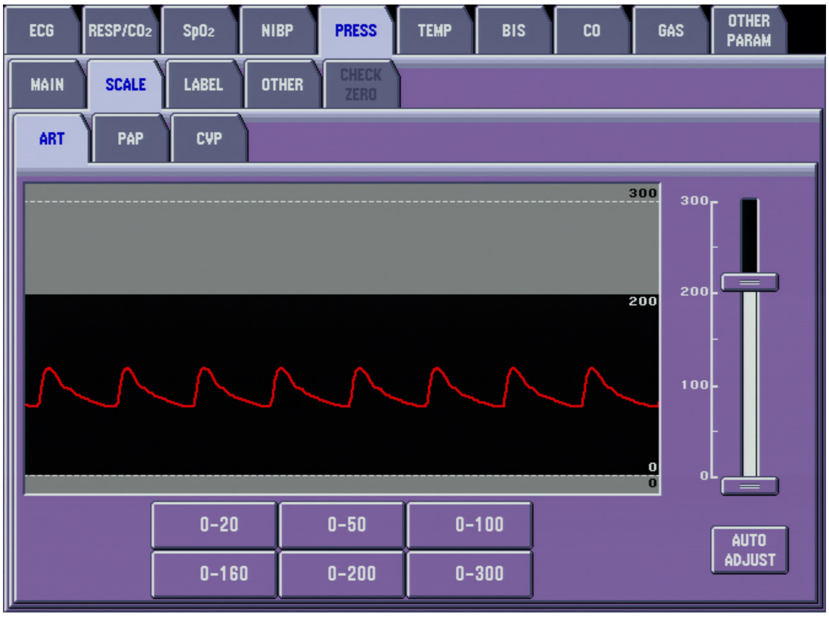
The IBP waveform sweep speed and the waveform display of all monitoring IBP labels on the home screen can be selected on the DISPLAY window.

On the LABEL Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
LABEL
OTHER
CHECK ZERO
ART
CVP
PAP
SELECTABLE ITEMS
P1
ART
UV
ICP
P2
ART2
PAP
ICP2
P3
RAD
CVP
ICP3
P4
DORS
RAP
ICP4
P5
AO
RVP
P6
FEM
LAP
P7
UA
LVP

Select the blood pressure label for the line connected to the MULTI socket from <SELECTABLE ITEMS> box.

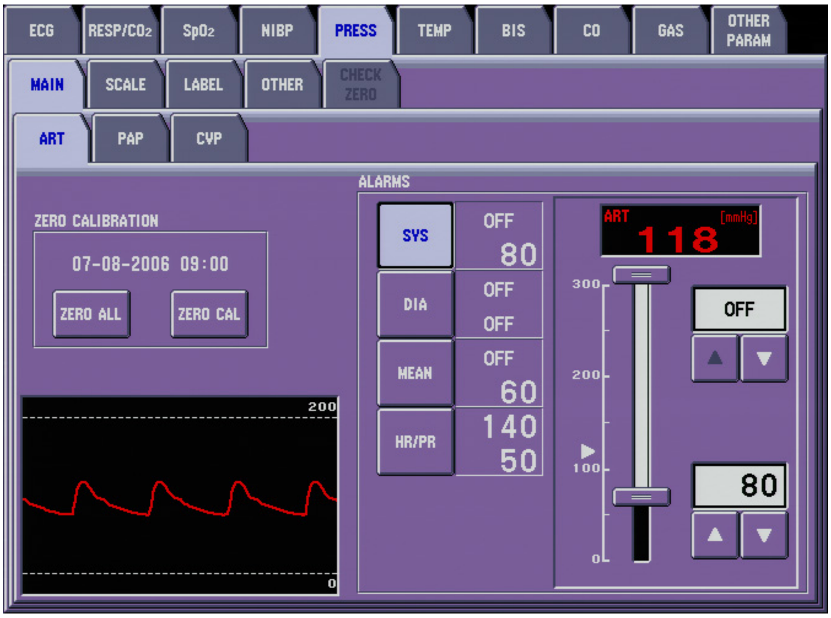
On the SCALE Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
LABEL
OTHER
CHECK ZERO
ART
PAP
CVP
300
200
0
0
300
200
100
0
0-20
0-50
0-100
0-160
0-200
0-300
AUTO ADJUST

Select the scale for the blood pressure line waveform on the home screen. The same scale is used on both the home screen and PRESS window.

You can touch the AUTO ADJUST key to automatically select the appropriate scale.

On the MAIN Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
LABEL
OTHER
CHECK ZERO
ART
PAP
CVP
ZERO CALIBRATION
07-08-2006 09:00
ZERO ALL
ZERO CAL
ALARMS
SYS
OFF
80
DIA
OFF
OFF
MEAN
OFF
60
HR/PR
140
50
ART
[mmHg]
118
300
200
100
0
OFF
80
200
0

<ALARMS>

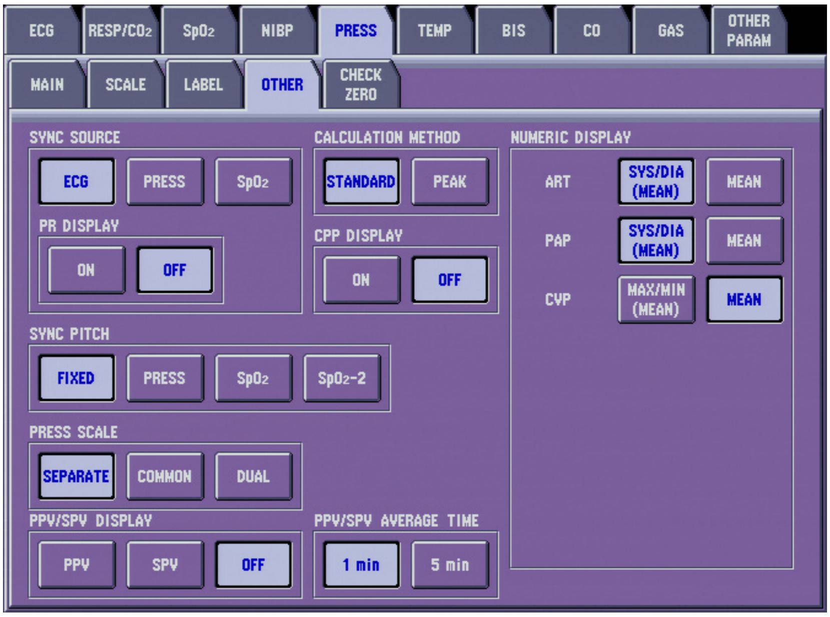
SYS alarm limits: Set the upper and lower systolic alarm limits.

DIA alarm limits: Set the upper and lower diastolic alarm limits.

MEAN alarm limits: Set the upper and lower mean alarm limits.

HR/PR alarm limits: Set the upper and lower heart rate or pulse rate alarm limits.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
SCALE
LABEL
OTHER
CHECK ZERO
SYNC SOURCE
ECG
PRESS
SpO2
PR DISPLAY
ON
OFF
CALCULATION METHOD
STANDARD
PEAK
CPP DISPLAY
ON
OFF
NUMERIC DISPLAY
ART
SYS/DIA (MEAN)
MEAN
PAP
SYS/DIA (MEAN)
MEAN
CVP
MAX/MIN (MEAN)
MEAN
SYNC PITCH
FIXED
PRESS
SpO2
SpO2-2
PRESS SCALE
SEPARATE
COMMON
DUAL
PPV/SPV DISPLAY
PPV
SPV
OFF
PPV/SPV AVERAGE TIME
1 min
5 min

<SYNC SOURCE>: Select the sync sound source from ECG (heart rate), arterial blood pressure (IBP) and SpO_2.

NOTE:

- When heart rate is unstable because of an ESU, select SpO_2 or PRESS.
- When the connection cord of SpO_2 or IBP of the arterial blood pressure is disconnected from the monitor and an alarm occurs when the sync source is set to SpO_2 or PRESS, the sync source changes to ECG when the alarm is silenced by pressing the [SILENCE ALARMS] key. The sync source returns to SpO_2 or PRESS when the SpO_2 or IBP is monitored again. When using IBP as the sync source, adjust zero balance.
- When the sensor is detached from the patient and alarm occurs, and the sync source is set to SpO_2 or PRESS, the sync source does not change to ECG when the alarm is silenced, and "- - -" is displayed for PR.
- The SpO_2-2 cannot be set to the sync sound source.

<PR DISPLAY>: Select the pulse rate display on or off. This setting is only available when <SYNC SOURCE> is set to ECG.

<CALCULATION METHOD>: Select the IBP calculation mode.

STANDARD: The IBP values are calculated by moving average. The monitor averages the latest 8 consecutive pulses and displays this average as the IBP value. When a new pulse is detected, the IBP value is recalculated using the latest 8 pulses. The IBP value display is updated every 3 seconds.
PEAK: The systolic, diastolic and mean values of the highest pulse wave in the latest 8 consecutive pulses are displayed as the IBP values. The IBP value display is updated every 3 seconds.
When connected IABP causes the IBP values to vary greatly, use PEAK to improve measurement accuracy.

<CPP DISPLAY>: Select the CPP display on the home screen ON or OFF when monitoring ICP.

<NUMERIC DISPLAY>: Select the IBP/ICP display mode on the home screen.
SYS/DIA(MEAN): Displays the systolic blood pressure (SYS), diastolic blood pressure (DIA) and the averaged blood pressure (MEAN).
MEAN: Displays only the averaged blood pressure.

<SYNC PITCH>: Select the sync sound pitch.
FIXED: The pitch is fixed to the pitch selected on the SYSTEM SETUP window.
PRESS: The pitch is high when the BP value is above 120 mmHg. The pitch is low when the BP value is below 20 mmHg. The pitch changes in 20 steps from high to low for each 5 mmHg change between 120 and 20 mmHg BP value. The BP value of the highest priority arterial blood pressure is used.
SpO_2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2 connected to the SpO_2 socket.
SpO_2-2: The pitch changes in 20 steps from high to low for each 1%SpO_2 change between 100%SpO_2 and 81%SpO_2 in SpO_2 value of SpO_2-2 connected to the MULTI socket. SpO_2-2 is only available for the AY-661P, AY-663P, AY-671P or AY-673P input unit.

<PRESS SCALE>: Select the display mode for IBP waveforms.
SEPARATE: IBP waveforms are displayed separately on different scales.
COMMON: All IBP waveforms are displayed on the same scale.
DUAL: IBP waveforms are separated into arterial blood pressures and other type of blood pressures. The arterial blood pressures are labeled ART, ART-2, RAD, DORS, AO, FEM, UA, LVP and PRESS (P1 to P7).

<PPV/SPV DISPLAY>: Select PPV or SPV to be displayed on the home screen. Select OFF when not displaying either PPV or SPV.

NOTE:
- PPV or SPV of IBP with the highest priority label of arterial blood pressure (ART, ART2, RAD, DORS, AO or FEM) is displayed. If the connection cord of IBP whose PPV or SPV is monitored is disconnected from the monitor, PPV or SPV of the blood pressure with the second priority label is monitored. If the disconnected IBP is connected again, PPV or SPV of the highest priority label is monitored again. In such a case, adjust zero balance.
- PPV or SPV is accurately measured when the patient is using a ventilator and when there is no patient movement and no arrhythmias. In the following cases, PPV or SPV is not accurate or cannot be measured.
  - Patient movement
  - Spontaneous respiration
  - Arrhythmia
  - Respiration rate less than 6 counts/min

  - Ventilation volume less than 8 mL/kg
  - Acute right heart failure
- This setting is common for all IBP labels. It only needs to be set on one label window.

<PPV/SPV AVERAGE TIME>: Select the averaging time for PPV or SPV display. 5 min is appropriate for monitoring variation for long term (more than an hour) with less noise interference.

NOTE:

- This setting is only available when “PPV” or “SPV” is selected for the <PPV/SPV DISPLAY> setting.
- This setting is common for all IBP labels. It only needs to be set on one label window.

Temperature

Preparation

Select the appropriate probe according to the purpose.

CAUTION

Select the appropriate probe for the patient. Using adult probes on premature infants and children may injure the mucous membrane.

CAUTION

The insulation pad may irritate the skin. In long term monitoring, change the attachment site to prevent irritation.

NOTE:

- When the measuring site is exposed directly to air, the temperature may be lower than normal. It takes about 20 to 30 minutes to reach the equilibrium temperature after attaching the sensor.
- The monitor simulates the temperature signal of 27°C and 37°C inside the monitor. Monitoring this simulated signal periodically, the monitor self-diagnoses the temperature signal processor part of the monitor. When the monitor could not cover the 0 to 45°C measurement range, a "MPU MODULE ERROR" message is displayed.

Reusable Probes

Thermistor Probe	Purpose
401J	For adult rectum/esophagus
402J	For child rectum/esophagus
409J	For body surface

Disposable Probes

Disposable Probe		Thickness	Purpose
Sonatemp	5-13212*	12F	For esophagus
	5-13218*	18F	
	5-13224*	24F	
Foley catheter	5-18808*	8F	For bladder
	5-18810*	10F	
	5-18812*	12F	
	5-18814*	14F	
	5-18816*	16F	
	5-18818*	18F	

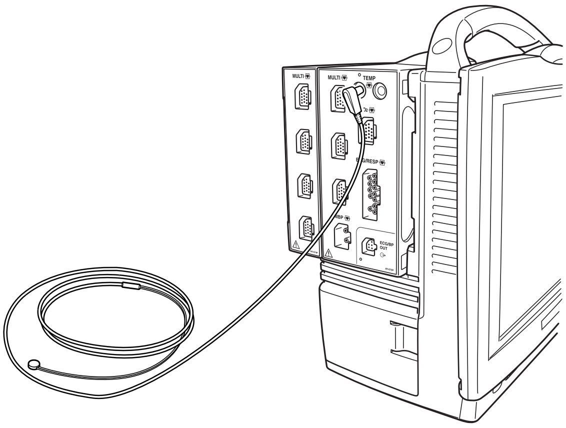
* These parts have not been checked for compliance with the MDD (Medical Device Directive). For EC member countries, Nihon Kohden recommends the use of parts that comply with MDD.

To connect the disposable probe to the TEMP socket or MULTI socket on the unit, the extension cable is required.

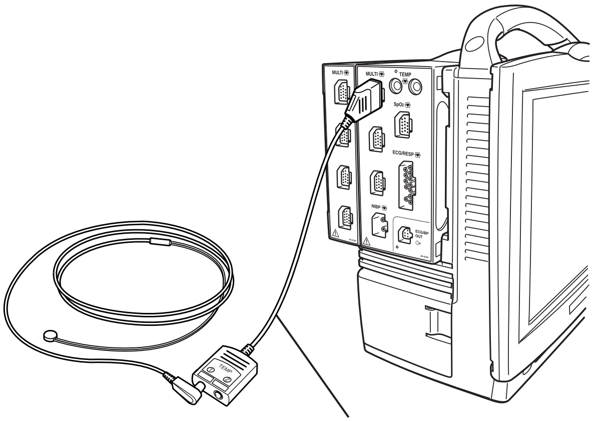
To connect the reusable probe or disposable probe to the MULTI socket on the unit, the JT-900P temperature connection cord is required.

A reusable probe can be directly connected to the TEMP socket on the unit.

NOTE: The MULTI socket on the AY-660P input unit cannot be used for monitoring temperature.



When connecting the 409J reusable probe for the body surface to the TEMP socket



JT-900P temperature connection cord

When connecting the 409J reusable probe for the body surface to the MULTI socket

Using the Insulation Pad

The pad prevents the environmental temperature from affecting the sensor temperature and also prevents internal body heat from escaping at the attached site so that a stable temperature is obtained.

Changing Temperature Settings

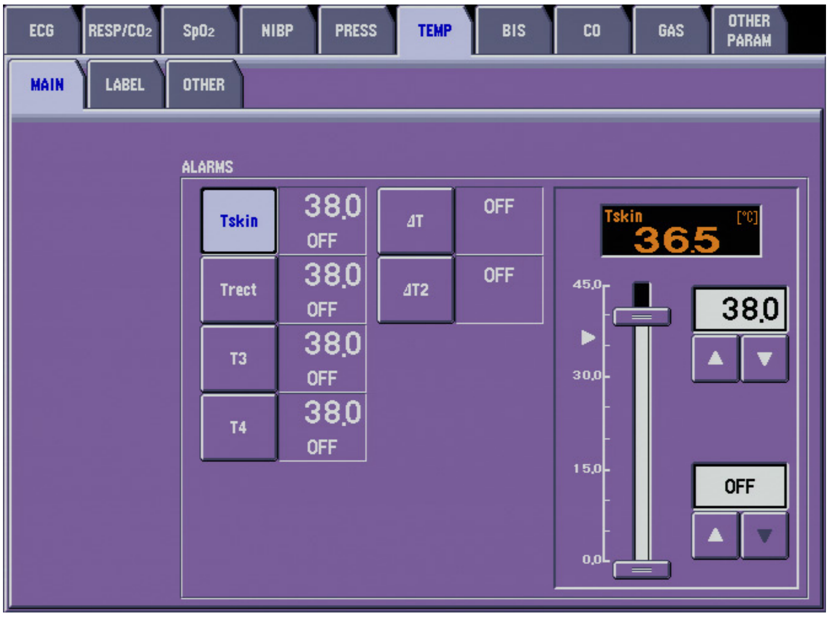
Change settings on the TEMP window. The following settings can be changed for monitoring temperature.

- Label
- Temperature alarm limits
- Delta temperature equation setting

The temperature unit can be set to °C or °F on the SYSTEM CONFIGURATION screen.

The temperature data display color can be set on the SYSTEM SETUP window.

On the MAIN Page



ALARMS

Tskin 38.0 OFF

Trect 38.0 OFF

T3 38.0 OFF

T4 38.0 OFF

ΔT OFF

ΔT2 OFF

Tskin [°C] 36.5

38.0

OFF

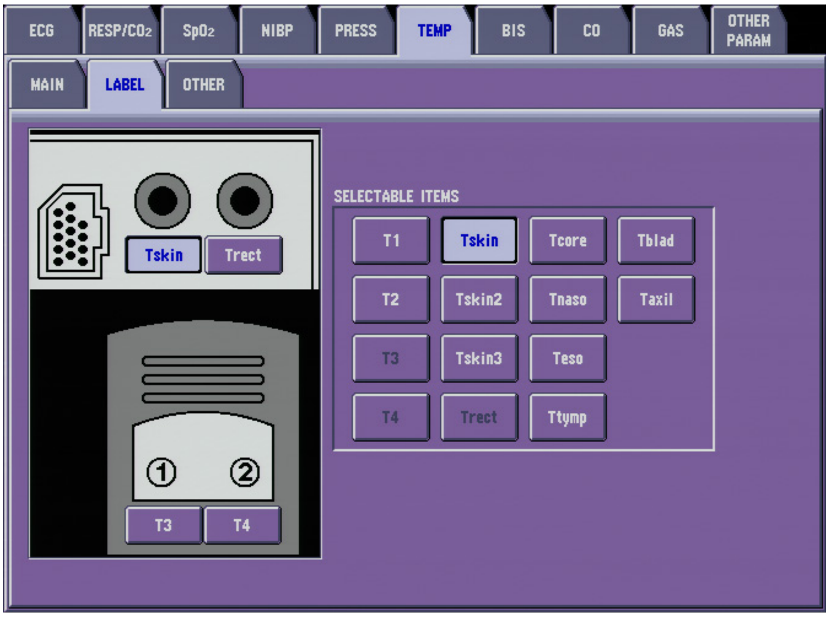
<ALARMS>

Temperature alarm limits: Set the upper and lower temperature alarm limits.

On the LABEL Page

CAUTION

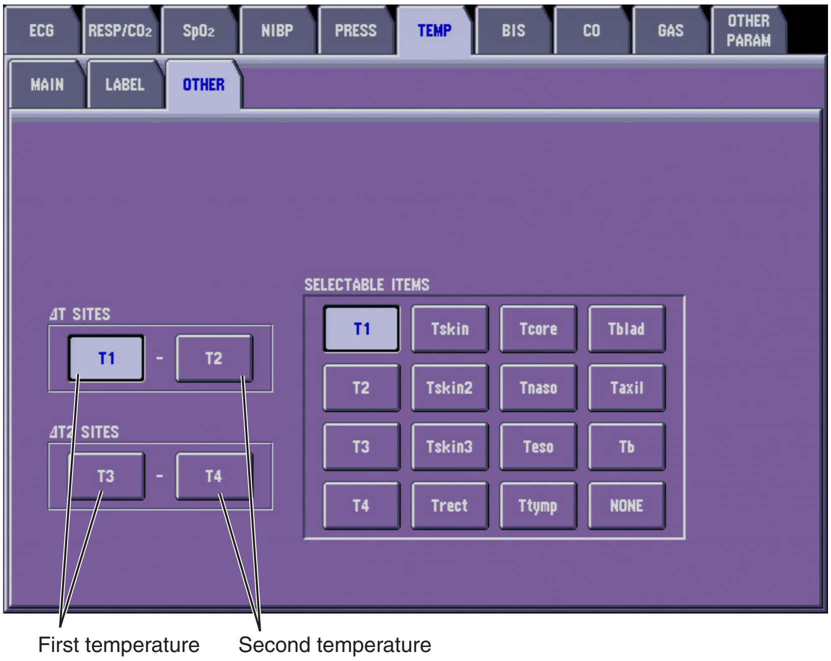
After changing the temperature label, do not reconnect the probe to another jack. This may cause an incorrect label display and lead to misjudgment.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
LABEL
OTHER
Tskin
Trect
T3
T4
①
②
SELECTABLE ITEMS
T1
Tskin
Tcore
Tblad
T2
Tskin2
Tnaso
Taxil
T3
Tskin3
Teso
T4
Trect
Ttymp

Select the site to be labeled and select the label from <SELECTABLE ITEMS> box.

On the OTHER Page

Temperature difference for two pairs of temperatures can be selected.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
LABEL
OTHER
ΔT SITES
T1
-
T2
ΔT2 SITES
T3
-
T4
SELECTABLE ITEMS
T1
Tskin
Tcore
Tblad
T2
Tskin2
Tnaso
Taxil
T3
Tskin3
Teso
Tb
T4
Trect
Ttymp
NONE
First temperature
Second temperature

<ΔT SITES>: Set the temperature difference equations to measure temperature differences. Select the label for the first temperature and second temperature from <SELECTABLE ITEMS> box.

<ΔT2 SITES>: Set the temperature difference equations to measure temperature differences. Select the label for the first temperature and second temperature from <SELECTABLE ITEMS> box.

If you do not need to monitor temperature difference, select NONE in <ΔT SITES> or <ΔT2 SITES> box.

BIS

BIS monitoring can be performed by using the QE-910P BIS processor/BISx (Aspect™ Medical Systems) or BIS monitor (Aspect™ Medical Systems). The BISx and BIS monitor are available direct from Aspect™ Medical Systems. The BISx is available from Nihon Kohden as QE-910P BIS processor.

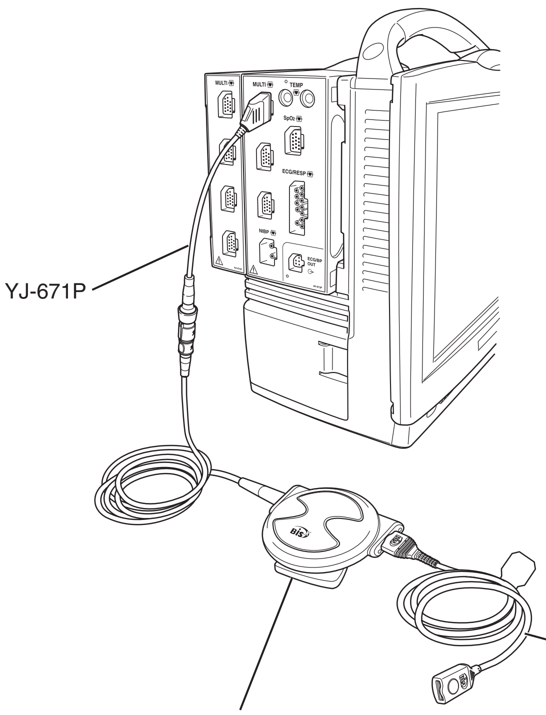
To use the BIS processor/BISx, the YJ-671P BISx connection cable is required. To connect the BIS monitor to the bedside monitor, the QF-902P interface is required.

Preparation

Select the appropriate BIS sensor according to the purpose. To connect the BIS sensor to the BIS processor/BISx, PIC Plus patient interface cable is required.

Connect the BIS sensor to the PIC plus patient interface cable, the patient interface cable to the BIS processor/BISx, the BIS processor to the YJ-671P BISx connection cable and BISx connection cable to the MULTI socket.

NOTE: The MULTI socket on the AY-660P input unit cannot be used for monitoring BIS.



WARNING

Do not place the BIS monitor or BIS processor above the patient. When installing the BIS monitor, use the pole clamp to firmly attach the BIS monitor to a secure pole (1.0 to 3.8 cm in diameter). Periodically check that the pole clamp knob is not loose. Use the clip on the back of the BIS processor to attach the BIS processor to the bed rail or pole. If the BIS monitor or BIS processor is not attached to a rail or pole, install it where it cannot fall or tip over. Otherwise, it may cause injury to the patient or operator.

WARNING

It is reported that BIS monitoring is not appropriate when an analgesic anesthetic agent, such as ketamin, fentanyl, morphine, or only a muscle relaxant is used.

WARNING

Do not perform defibrillation with the BIS sensor placed between the defibrillator pads.

WARNING

The conductive parts of electrodes or sensor and connectors, including the neutral electrode, should not contact other conductive parts, including earth.

WARNING

The hypnotic state of a patient undergoing surgery is influenced by the intensity of stimulation that is applied. During the course of a surgical procedure, the balance between the intensity of stimulation and sensory suppression may be constantly changing. Read the BIS value carefully.

WARNING

Reliance on the BIS alone for intraoperative anesthetic management is not recommended. Clinical judgement (patient face color, patient reaction, heart rate, blood pressure and other vital sign data) should always be used. BIS has been studied with the anesthetic agents listed in the “Drugs that have been Studied for Use with the BIS” section in the BIS reference guide, but the studied data are relative values and do not indicate the absolute value of the hypnotic level.

CAUTION

When performing electroconvulsive therapy (ECT), attach the BIS sensor as far as possible from the electrodes that are used for electrical shock. Otherwise noise from the electrodes may interfere and incorrect data is displayed on the screen.

CAUTION

Do not use an expired BIS sensor.

CAUTION

Turn off the automatic impedance check if the impedance check signal (1 nA, 128 Hz) interferes with other equipment.

CAUTION

When attaching the BIS sensor to the patient, press each electrode on the sensor for 5 seconds to reduce impedance between the electrode and skin.

CAUTION

Only use the specified BIS sensor.

WARNING

Due to limited clinical experience in the following applications, BIS values should be interpreted cautiously in patients with known neurological disorders such as epilepsy, patients taking other psychoactive medications, patients with cerebral infarction and in children below the age of 18.

CAUTION

- The BIS sensor is single use only. Do not reuse it.
- Do not reuse the BIS sensor for another patient. There are a lot of fine projections on the BIS sensor. Reusing the BIS sensor for another patient may cause infection to another patient by bacteria adhering to the BIS sensor.
- Do not use the BIS sensor for more than 24 hours. It affects monitoring accuracy.

CAUTION

To minimize the risk of patient strangulation, the PIC Plus patient interface cable must be carefully placed and secured.

CAUTION

Do not let the BIS processor continuously contact the patient’s body. The BIS processor heats up during operation and it may cause low temperature burn to the patient.

CAUTION

When the “BIS CONNECTOR OFF” message is displayed, check that the BIS processor is firmly connected to the connection cable and connection cable is firmly connected to the monitor. The BIS cannot be monitored and the alarm does not function while this message is displayed.

CAUTION

The BIS processor cannot be sterilized. Sterilizing the BIS processor may damage it.

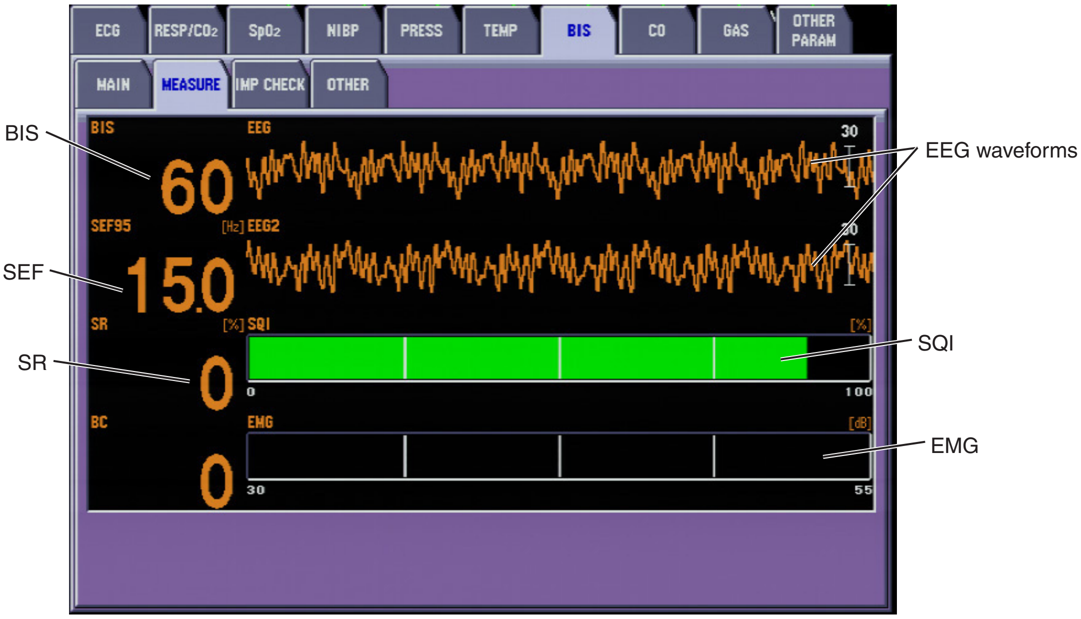
CAUTION

- The following physiological factors and external factors must be considered in BIS monitoring.
  1. Ischemia or hypoxia, when severe enough to cause global EEG slowing or outright suppression, results in a decrease in the BIS value. It is important to bear in mind that the frontal montage used for BIS monitoring usually will not detect episodes of focal ischemia caused by embolic events.
  2. Hypothermia will generally result in a corresponding decrease in BIS levels as brain processes slow. More profound hypothermia used during cardiac bypass procedures will cause suppression of the EEG and, consequently, a very low BIS.
  3. Artifacts and signal of poor quality cause the BIS to be unreliable. Such artifacts are caused by poor contact of sensor to skin, muscle activity or rigidity, head or body movement, eye movement, inappropriate sensor attachment and other electrical interference. Some examples are given below.
     a) Hum noise: Usually there is no hum interference, but when the hum filter is turned off and a signal larger than 100 µV is superimposed on the EEG waveform on the screen, BIS may increase.
     b) ESU (unipolar):The noise generated by unipolar ESU is so large that it saturates the EEG signal so that EEG waveforms cannot be acquired. BIS value first blinks (SQI decreases) and then disappears. After stopping the use of the ESU, BIS value is displayed again.
     c) ESU (bipolar): Bipolar ESU causes low amplitude high frequency wave signals which may be mistaken as EEG and thus cause an increase in BIS value. If there is unexpected increase in BIS, monitor EEG carefully and read the BIS value carefully.
     d) ECG: The BIS processor has a filter for detecting ECG, but large ECG may be mistaken as EEG. If ECG artifact is seen on the EEG, read the BIS value carefully.
     e) Pulse wave: There may be an interference caused by the pulse wave when the BIS sensor is attached near an artery. Reattach the BIS sensor to the appropriate site.
     f) Pacemaker: If pacing spikes can be seen on the EEG, the BIS may be affected. Read the BIS value carefully.
     g) EMG: EMG is a signal of high frequency wave of more than 500 µV (generally more than 30 Hz). There is an increase in EMG as the patient is emerging from anesthesia. Muscle activity is seen during surgery. The BIS processor has a filter for detecting EMG, but the increase in EMG causes an increase in the BIS value. Shivering in a patient who is emerging from anesthesia may increase EMG and artifact on EEG, resulting in an increase in BIS value.
- Check the BIS sensor attachment when there is an unexpected EMG increase and SQI decrease. If EMG still increases after having checked the sensor attachment, there may be an electromagnetic interference. Check the surrounding equipment and power supply.

NOTE: Connect the BSM connector of the BIS processor to the BISx connection cable until you hear a click.

On the MEASURE Page (When using the BIS Processor)

Displays the BIS data and EEG waveforms.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
MEASURE
IMP CHECK
OTHER
BIS
60
EEG
30
SEF95
[Hz]
15.0
EEG2
30
SR
[%]
0
SQI
[%]
0
100
BC
0
EMG
[dB]
30
55
BIS
SEF
SR
EEG waveforms
SQI
EMG

Changing the BIS Settings

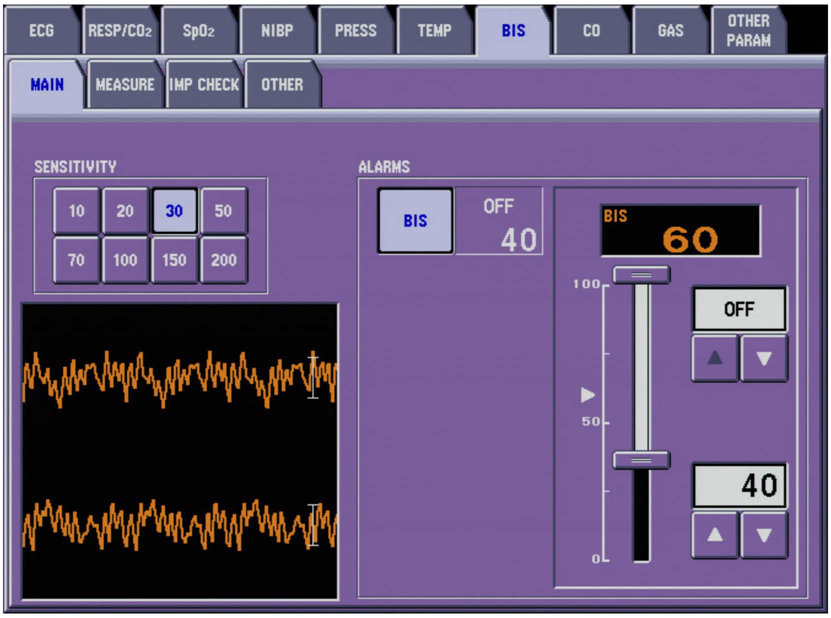
When using the BIS processor or BISx, the following settings can be changed for BIS monitoring. Change the settings on the BIS window.

- BIS alarm limits
- BIS waveform sensitivity
- Check impedance and auto impedance check on or off
- Filter on or off
- Smoothing rate
- BIS waveform sweep speed
- Parameter for second current trendgraph

The display color for BIS can be set on the SYSTEM SETUP window.

When using the BIS monitor, only the measured values are displayed on the monitor screen.

On the MAIN Page


ECG
RESP/CO₂
SpO₂
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
MEASURE
IMP CHECK
OTHER
SENSITIVITY
10
20
30
50
70
100
150
200
ALARMS
BIS
OFF
40
BIS
60
100
50
0
OFF
▲
▼
40
▲
▼

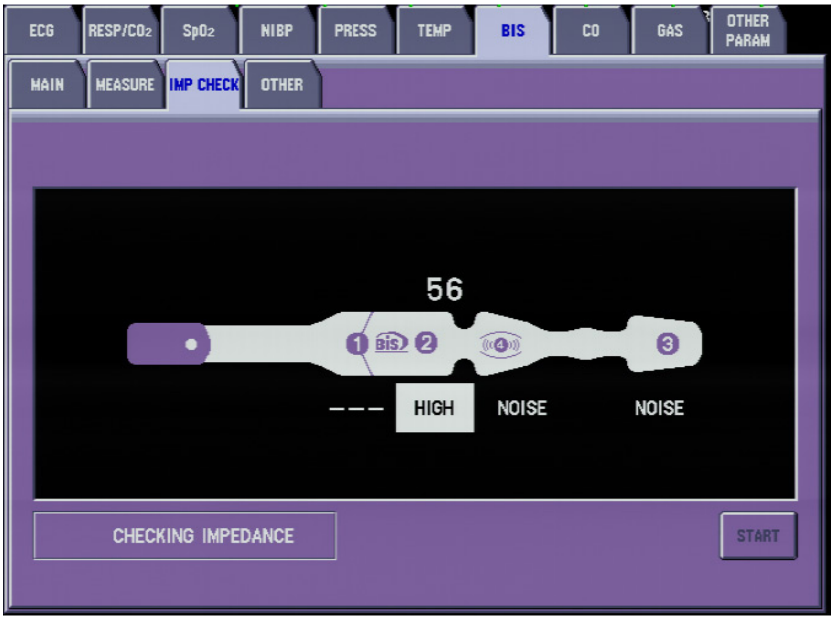
<SENSITIVITY>: Select sensitivity for BIS waveform on the home screen.

<ALARMS>

BIS alarm limits: Set the upper and lower BIS alarm limits.

On the IMP CHECK Page

This setting is not available when using the BIS monitor.


ECG
RESP/CO₂
SpO₂
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
MEASURE
IMP CHECK
OTHER
56
1
BIS
2
4
3

HIGH
NOISE
NOISE
CHECKING IMPEDANCE
START

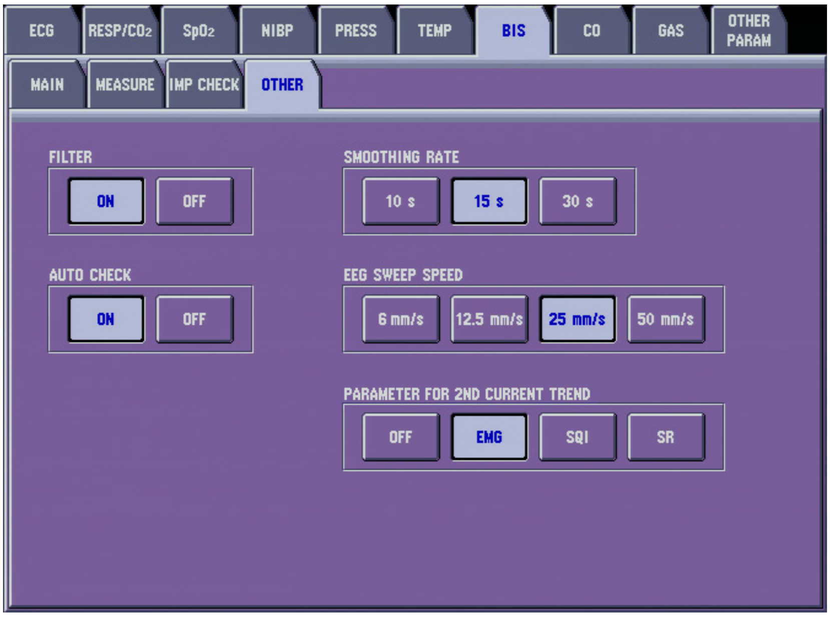
Check the impedance between the BIS sensor and skin.

Check the impedance between the BIS sensor and skin. If the check result is not “PASS”, remove the cause and repeat the impedance check until the result becomes “PASS”.

The impedance check can be performed automatically and manually. Set <AUTO CHECK> on the OTHER page to ON to perform the impedance check automatically. To perform the impedance check manually, set <AUTO CHECK> to OFF.

PASS:	The impedance check is OK. The impedance is 7.5 kΩ or less. However, the result of the #2 ground electrode becomes “PASS” when the impedance is 100 kΩ or less.
HIGH:	The impedance is above 7.5 kΩ. As long as the sum of the impedance of all electrodes except for the ground electrode is 15 kΩ or less, the check result becomes “PASS”. If the check result is over 15 kΩ, clean the skin where the BIS sensor will be attached.
NOISE:	The signal from the electrode exceeds the measurable range. Check the BIS sensor attachment. Replace the BIS sensor with a new one if necessary.
LDOFF:	Connector connection is loose or disconnected. Check the connection from the BIS sensor to the monitor. If necessary, replace the BIS sensor or PIC Plus patient interface cable with a new one.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MAIN
MEASURE
IMP CHECK
OTHER
FILTER
ON
OFF
SMOOTHING RATE
10 s
15 s
30 s
AUTO CHECK
ON
OFF
EEG SWEEP SPEED
6 mm/s
12.5 mm/s
25 mm/s
50 mm/s
PARAMETER FOR 2ND CURRENT TREND
OFF
EMG
SQI
SR

<FILTER>: Turn the high-cut filter, low-cut filter and AC filter on or off.

<SMOOTHING RATE>: Select the smoothing rate over which the BIS value is averaged.

<AUTO CHECK>: Turn the automatic impedance check on or off.

<EEG SWEEP SPEED>: Change the sweep speed of EEG waveform on the home screen and MEASURE window.

<PARAMETER FOR 2ND CURRENT TREND>: Select the second parameter to be displayed as a trendgraph on the home screen.

Cardiac Output

CO (Cardiac Output) measurement is performed by connecting the measuring system to the MULTI socket on unit. This monitor uses the thermodilution method.

WARNING

When performing defibrillation during cardiac output monitoring, never touch the CO connection cord. The discharged energy may cause electrical shock or injury.

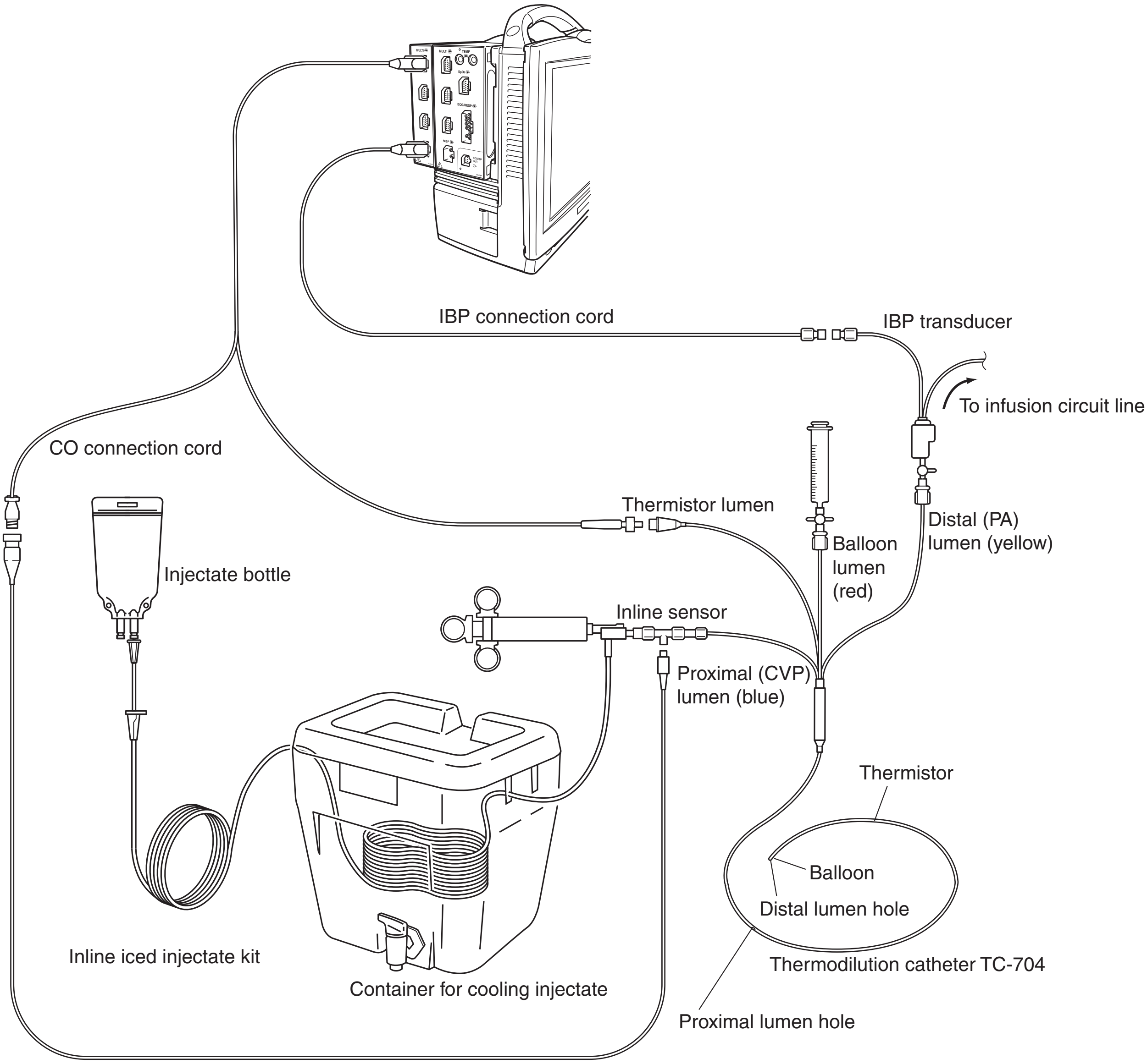
NOTE:

- CO monitoring using the MULTI socket does not comply with the Defibrillator proof type CF.
- The MULTI socket on the AY-660P input unit cannot be used for CO monitoring.

Preparation

Select the appropriate catheter according to the purpose. The following illustrates a typical measuring system setup. For details, refer to the instruction manual of the measuring kit.

When using the Becton Dickinson Catheter TC-704 and measuring with the in-line sensor method


IBP connection cord
IBP transducer
To infusion circuit line
CO connection cord
Thermistor lumen
Distal (PA) lumen (yellow)
Balloon lumen (red)
Injectate bottle
Inline sensor
Proximal (CVP) lumen (blue)
Thermistor
Balloon
Distal lumen hole
Thermodilution catheter TC-704
Inline iced injectate kit
Container for cooling injectate
Proximal lumen hole

Measuring the Pulmonary Capillary Wedge Pressure

Inserting and Retaining the Catheter in the Patient

For details and precautions on the methods of inserting the catheter, refer to relevant literature and manuals.

WARNING

- Insert or remove the catheter from the pulmonary artery as quickly as possible. If it takes longer than about 10 seconds, pulmonary infarction, pulmonary hemorrhage or pulmonary artery perforation may occur.
- When inserting or removing the catheter, check the blood pressure waveform on the monitor, X-ray unit images, and other equipment. Do not depend on the insertion or removal messages displayed on the monitor.

NOTE:

- Set the label to PAP to monitor the blood pressure for checking the catheter position.
- When inserting the catheter into the patient, monitor the blood pressure waveform and check the position of the catheter at all times.
- If inserting the catheter takes a long time, the catheter may soften from body heat or there may be spasm in the vein which makes inserting the catheter more difficult.
- Be careful not to burst the balloon. It may cause embolization. To inflate the balloon, use carbon dioxide and not air. Inflate the balloon slowly while observing the blood pressure waveform on the monitor.
- Arrhythmia may occur when the catheter is inserted through the ventricle. Monitor ECG.

1. Quickly insert the catheter to the right atrium and inflate the balloon.

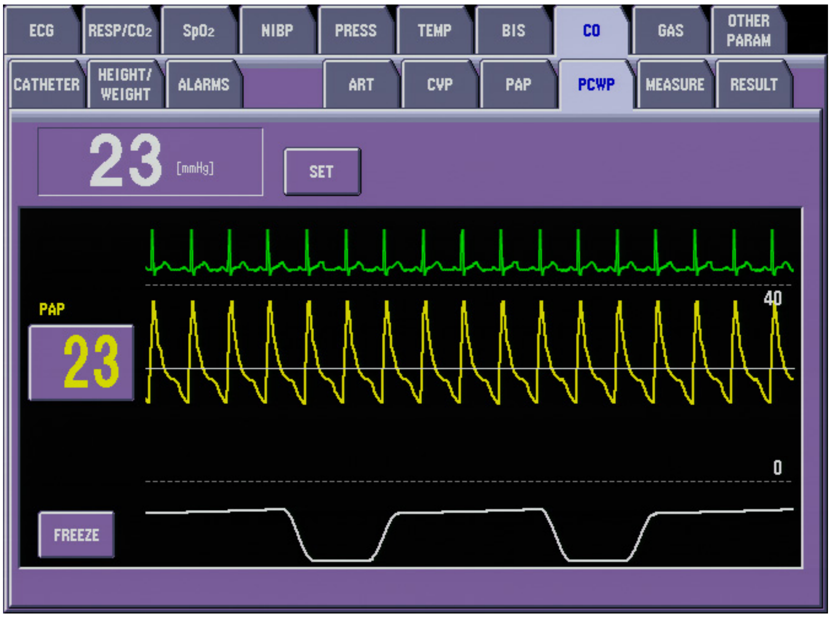
2. While checking the position of the catheter from the pressure waveform on the home screen, push it slowly to the pulmonary artery in the direction of the blood flow.

3. After inserting the catheter to the position where the pulmonary capillary wedge pressure (PCWP) waveform can be obtained, deflate the balloon promptly, and check that the pulmonary artery pressure (PAP) waveform is obtained.

4. After determining the position at which the PCWP waveform is obtained when the balloon is inflated and the PAP waveform is obtained when deflated, retain the catheter in the pulmonary artery.

NOTE: Monitor the pulmonary artery pressure (PAP) waveform while retaining the catheter and check at all times that the tip of the catheter is at the main branches of the pulmonary artery and not wedging into a peripheral artery.

Entering the PCWP and IBP Values


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
23 [mmHg]
SET
PAP
23
40
0
FREEZE

Enter the IBP values required for calculating the CO. When the IBP lines are labeled correctly, these values are automatically entered.

1. Touch the ART tab to enter ART mean value, CVP tab to enter CVP mean value, PAP tab to enter PAP value and PCWP tab to enter PCWP. The value appears in the upper part of the window.

   You can change the value by moving the horizontal cursor with your finger. You can also freeze the waveform by touching the FREEZE key. To unfreeze, touch the FREEZE key again

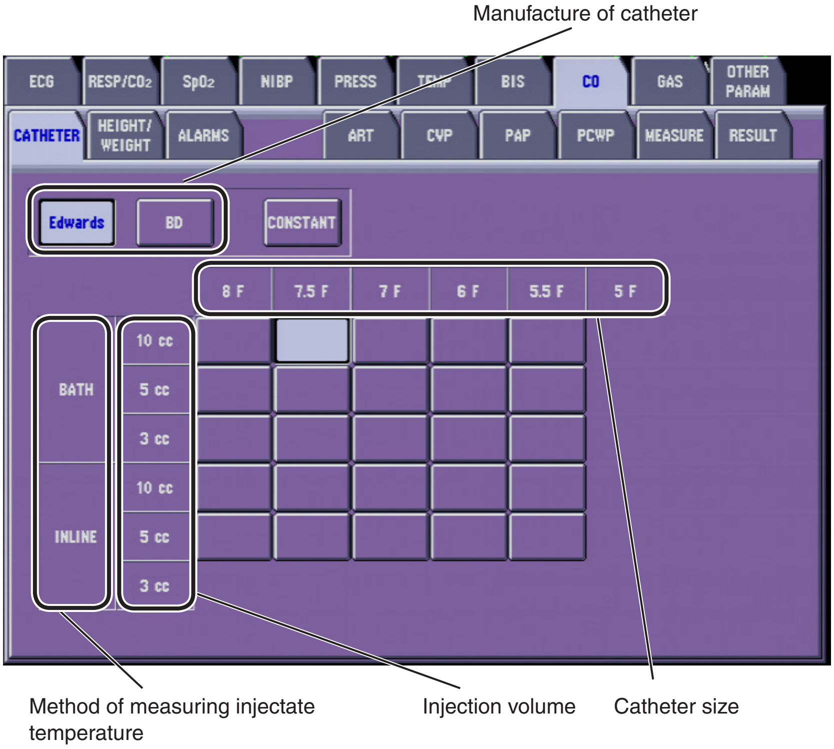
2. Touch the SET key. The value is entered into the table on the RESULT page.

Measuring Cardiac Output

When the catheter has been inserted, CO measurements can be performed. Before measurements, the coefficient value of the catheter and patient height and weight must be entered.

Changing Settings for CO Measurement

NOTE: The settings, such as injectate volume and catheter size are necessary for calculating CO. These settings cannot be changed after measurement.

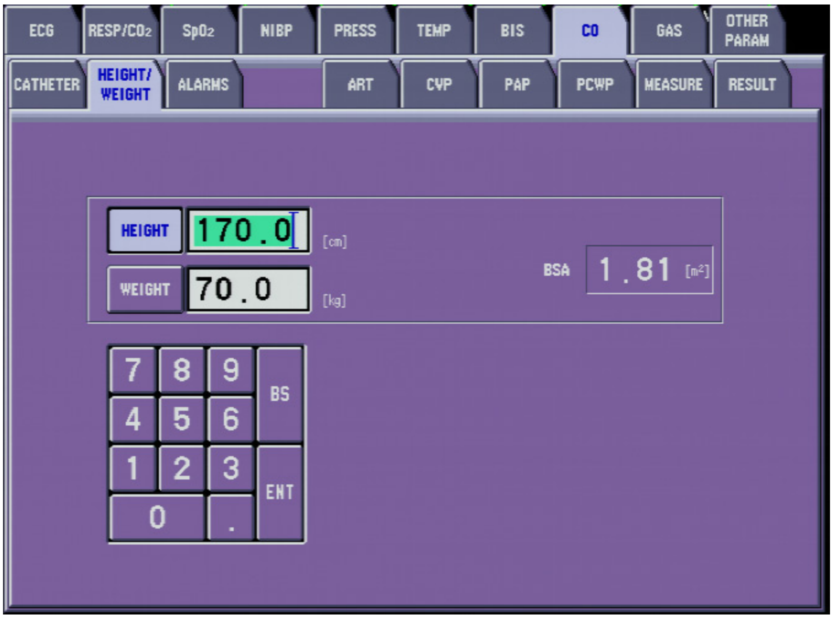

Manufacture of catheter
ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
Edwards
BD
CONSTANT
8 F
7.5 F
7 F
6 F
5.5 F
5 F
BATH
INLINE
10 cc
5 cc
3 cc
10 cc
5 cc
3 cc
Method of measuring injectate temperature
Injection volume
Catheter size

1. Set the coefficient value on the CATHETER page.

   When using a Becton Dickinson or Edwards Lifesciences (Baxter) catheter, the injectate temperature is automatically measured by this monitor. Enter the manufacturer of catheter, catheter size, injectate volume and injectate temperature.

   When using a catheter other than Becton Dickinson or Edwards Lifesciences (Baxter), enter the computation constant manually. Touch the CONSTANT key and enter the computation constant using the numeric keypad on the window. Check the value on the catheter manual.

When using a catheter other than bath probe or inline sensor and not setting the injectate temperature on the monitor, select the coefficient value from the bath probe table. In this case, "– – –" is displayed for Ti on the screen.

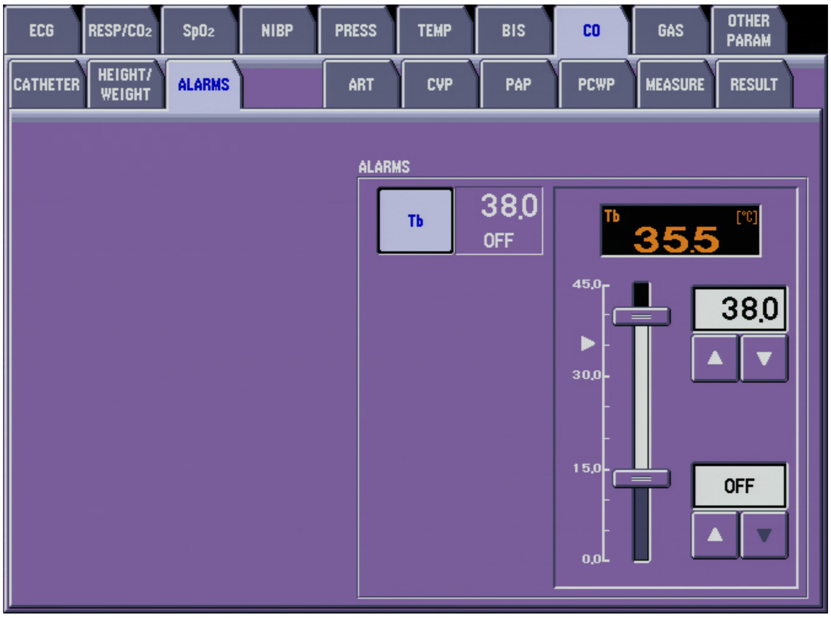

ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
7 8 9
4 5 6
1 2 3
0 .
BS
ENT

HEIGHT 170.0 [cm]

WEIGHT 70.0 [kg]

BSA 1.81 [m²]

2. Set the patient's height and weight on the HEIGHT/WEIGHT page. BSA is automatically calculated when the ENT key is touched.


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
ALARMS
Tb
Tb [°C]
35.5
45.0
30.0
15.0
0.0

Tb 38.0 OFF

Upper limit: 38.0

Lower limit: OFF

3. Set the upper and lower Tb alarm limits on the ALARMS page.

Measuring CO

Before Measurement

Do the following before measurement.

1. Completely fill the blood pressure transducer, dome and tubes with physiological saline with heparin to eliminate air completely.

2. Inject physiological saline with heparin in the CVP lumen of the catheter using a syringe and check that liquid flows out from the tip of the CVP lumen.

3. Fill the PA lumen with physiological saline with heparin.

Check the following before measurement.

1. Check the injectate temperature (Ti) on the home screen or CO window.

   NOTE: When the injectate temperature is not appropriate, the "Ti OUT OF RANGE" message appears on the screen and CO cannot be measured.

2. Check that the injectate temperature measurement lines (thermistor probe and in-line sensor) are connected correctly.

   NOTE: If these are disconnected, the monitor assumes the injectate temperature to be 0°C (32°F).

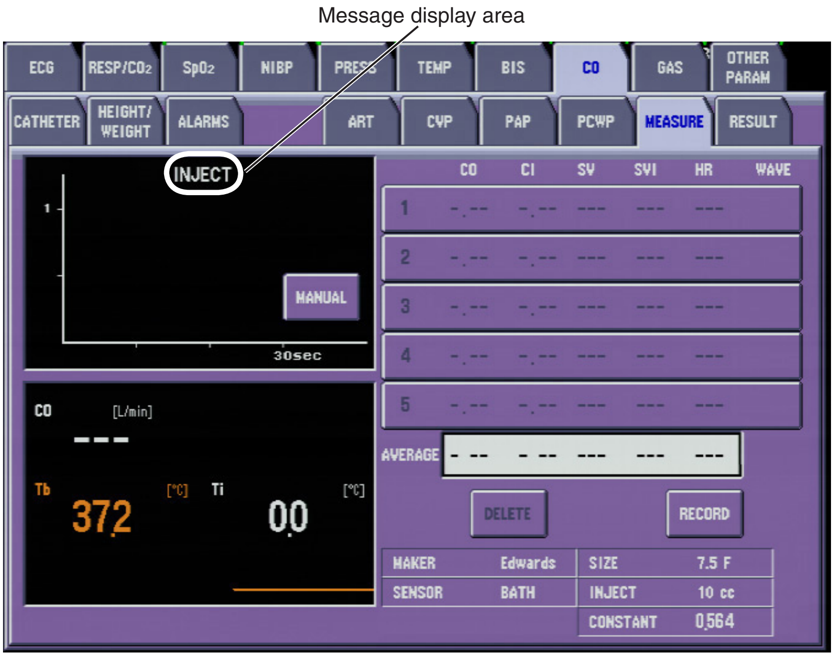
3. Check the catheter settings on the CATHETER page of the CO window.

   NOTE: The settings, such as injectate volume and catheter size are necessary for calculating CO. These settings cannot be changed after measurement.

Measuring CO

CAUTION

Do not measure the cardiac output repeatedly at short intervals. Frequently injecting the injectate affects the measuring accuracy.



	CO	CI	SV	SVI	HR	WAVE
1	-.--	-.--	---	---	---	
2	-.--	-.--	---	---	---	
3	-.--	-.--	---	---	---	
4	-.--	-.--	---	---	---	
5	-.--	-.--	---	---	---	
AVERAGE	- --	- --	---	---	---	

CO [L/min] ---

Tb 37.2 [°C] Ti 0.0 [°C]

MAKER	Edwards	SIZE	7.5 F
SENSOR	BATH	INJECT	10 cc
		CONSTANT	0.564

1. On the MEASURE page, check that the "INJECT" message is displayed and inject the injectate quickly within 4 minutes. CO measurement starts.

NOTE:

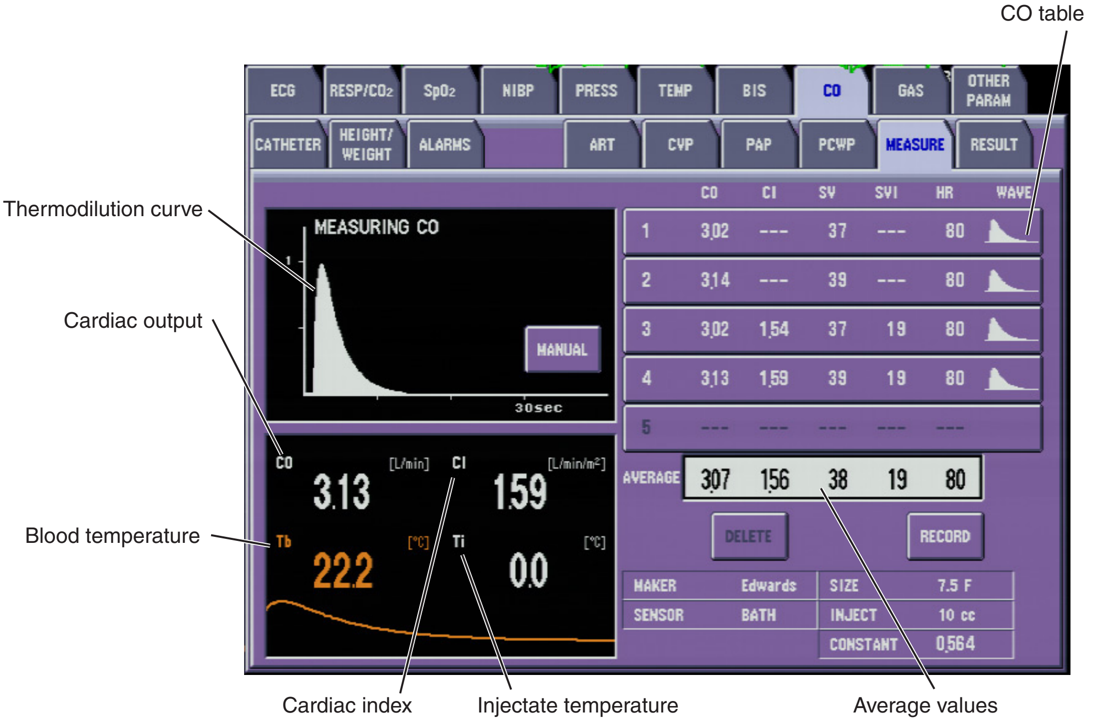
- If the injectate is not injected within 4 minutes, the "INJECTION TIME OUT" message appears. In this case, touch the MANUAL key on the MEASURE window and inject the injectate within 30 seconds.
- Inject the injectate as quickly and steadily as possible. Measurement cannot be performed correctly if injected slowly.

2. Check that the "MEASURING CO" message is displayed on the CO window.

NOTE: The monitor has not acknowledged the injection if the "MEASURING CO" message is not displayed on the CO window within about 10 seconds after the injectate has been injected. Inject the injectate again.

When the CO value is calculated, the measurement results are displayed in the CO table on the MEASURE page.

NOTE: Do not close the MEASURE page of the CO window before the measurement result is displayed in the CO table. Otherwise, the measured data will be lost.


CO table
Thermodilution curve
Cardiac output
Blood temperature
Cardiac index
Injectate temperature
Average values
ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
MEASURING CO
MANUAL
30sec
DELETE
RECORD

CO [L/min] 3.13 CI [L/min/m²] 1.59

Tb [°C] 22.2 Ti [°C] 0.0

	CO	CI	SV	SVI	HR	WAVE
1	3.02	---	37	---	80	
2	3.14	---	39	---	80	
3	3.02	1.54	37	19	80	
4	3.13	1.59	39	19	80	
5	---	---	---	---	---	
AVERAGE	3.07	1.56	38	19	80	

MAKER	Edwards	SIZE	7.5 F
SENSOR	BATH	INJECT	10 cc
		CONSTANT	0.564

When the “INJECT” message is displayed on the MEASURE window again, the injectate can be injected again. Up to five measurement data can be stored in memory and displayed in the CO table. If more than five measurements are performed, the oldest data is deleted.

NOTE: To register the CO values to the hemodynamics table, refer to the “Registering the Acquired Data to the HEMO Page of the TREND Window” section.

When Measurements Cannot be Performed Correctly

In some cases, measurements cannot be performed correctly because the baseline moves due to noise or conditions of the patient, such as physiological changes. In such cases, touch the MANUAL key on the MEASURE window and inject the injectate within 30 seconds. The point when the MANUAL key is touched is the start of measurement.

NOTE: If the injectate is not injected within 30 seconds, the “INJECTION TIME OUT” message appears.

Deleting the Data from the CO Table

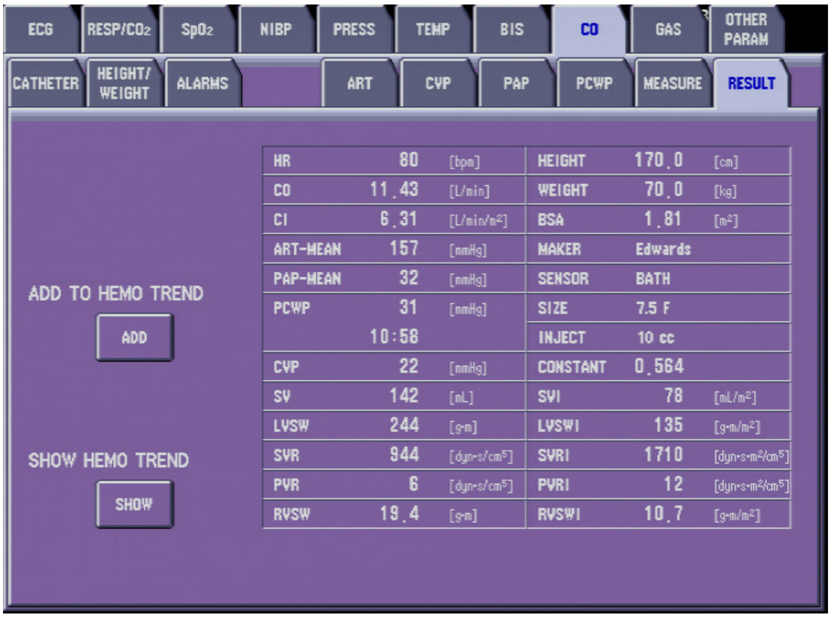
Up to five measurement data can be stored and displayed in the CO table on the MEASURE page. Stored data can be deleted from the list.

NOTE: Once data is deleted, it cannot be recovered.

1. On the MEASURE page, select the data to be deleted from the CO table.

2. Touch the DELETE key to delete data. The average is calculated again.

Adding the Acquired Data to the HEMO Page of the TREND Window


ECG
RESP/CO$_2$
SpO$_2$
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
CATHETER
HEIGHT/ WEIGHT
ALARMS
ART
CVP
PAP
PCWP
MEASURE
RESULT
ADD TO HEMO TREND
ADD
SHOW HEMO TREND
SHOW

HR	80	[bpm]	HEIGHT	170.0	[cm]
CO	11.43	[L/min]	WEIGHT	70.0	[kg]
CI	6.31	[L/min/m^2]	BSA	1.81	[m^2]
ART-MEAN	157	[mmHg]	MAKER	Edwards	
PAP-MEAN	32	[mmHg]	SENSOR	BATH	
PCWP	31	[mmHg]	SIZE	7.5 F	
	10:58		INJECT	10 cc	
CVP	22	[mmHg]	CONSTANT	0.564	
SV	142	[mL]	SVI	78	[mL/m^2]
LVSW	244	[g·m]	LVSWI	135	[g·m/m^2]
SVR	944	[dyn·s/cm^5]	SVRI	1710	[dyn·s·m^2/cm^5]
PVR	6	[dyn·s/cm^5]	PVRI	12	[dyn·s·m^2/cm^5]
RVSW	19.4	[g·m]	RVSWI	10.7	[g·m/m^2]

The acquired CO data can be added to the hemodynamics trend table in the HEMO page of the TREND window. When data is added to the HEMO page, the data disappears from the MEASURE page of the CO window. "- - -" appears on the CO data display area.

On the RESULT window, touch the ADD key. The acquired data is added to the HEMO page.

To display the hemodynamics trend table, touch the SHOW key.

GAS

The concentration of gases administered to and respired by the patient during anesthesia can be monitored by connecting the AG-920R multigas unit, GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit to the multi-link socket on the monitor. To connect the AG-920R multigas unit to the monitor, the QF-904P interface is required.

NOTE: GF-210R multigas unit and GF-120PA or GF-220R multigas/flow unit are not available for BSM-6000A series.

Carbon dioxide (CO_2), nitrous oxide (N_2O), oxygen (O_2), and any of five anesthetic agents (Halothane, Isoflurane, Enflurane, Sevoflurane and Desflurane) are monitored on a real-time, breath-by-breath basis. The inspiration and expiration phases are detected from the instantaneous CO_2 concentration and the respiration rate is counted from these phases. The measured data are displayed on the home screen and can be viewed with reference to other vital sign data.

The gas monitoring is also available by connecting a Dräger Medical Primus/Fabius® anesthesia workstation. To connect the Dräger Medical Primus/Fabius® anesthesia workstation, the IF-920P communication cable is required.

NOTE:

- When using the Dräger Medical Primus/Fabius® anesthesia workstation and the bedside monitor is connected to a central monitor network, gas values and waveforms are not output to the central monitor from the bedside monitor. No data or alarm regarding the gas data from the anesthesia workstation are displayed on the central monitor. Be careful of gas monitoring when the bedside monitor is connected to a central monitor network.
- The IF-920P communication cable is not available for BSM-6000A series.
- A Dräger Medical Primus/Fabius® anesthesia workstation cannot be used with any of the following external instruments.
  - AG-920R multigas unit
  - GF-110PA/GF-210R multigas unit
  - GF-120PA/GF-220R multigas/flow unit
  - Ventilator

Preparation

Using Multigas Unit

Set up the multigas unit and connect the unit to the patient.

Using Dräger Medical Primus/Fabius® Anesthesia Workstation

Set up the anesthesia workstation and connect it to the monitor. Refer to the IF-920P communication cable manual.

Changing Gas Settings

Change the settings on the GAS window. The following settings can be changed for gas monitoring.

Using Multigas Unit

- Respiration rate, apnea, CO_2, O_2, N_2O and agent alarm settings
- Scale for CO_2, O_2, N_2O and agent waveforms
- Sampling rate (when using AG-920R or GF-110PA multigas unit or GF-120PA multigas/flow unit)
- Perform air calibration

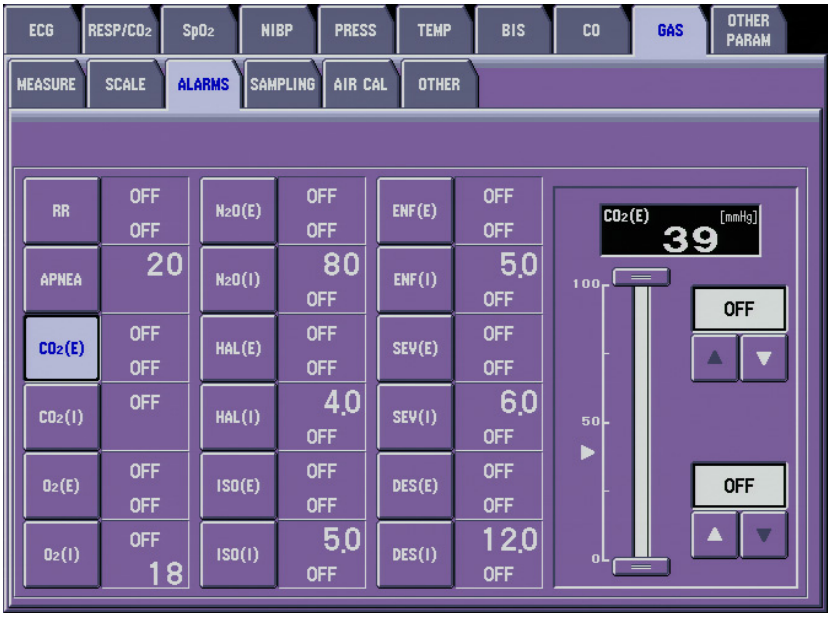
- Displaying gas parameters on the home screen
- Gas measurement on or off (when using GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit)

Using Dräger Medical Primus/Fabius® Anesthesia Workstation
Scale for CO_2, FLOW and Paw waveforms

The CO_2 unit can be set to mmHg or kPa on the SYSTEM CONFIGURATION screen.

The display color for each gas can be set on the SYSTEM SETUP window.

On the ALARMS Page



RR	OFF OFF	N2O(E)	OFF OFF	ENF(E)	OFF OFF
APNEA	20	N2O(I)	80 OFF	ENF(I)	5.0 OFF
CO2(E)	OFF OFF	HAL(E)	OFF OFF	SEV(E)	OFF OFF
CO2(I)	OFF	HAL(I)	4.0 OFF	SEV(I)	6.0 OFF
O2(E)	OFF OFF	ISO(E)	OFF OFF	DES(E)	OFF OFF
O2(I)	OFF 18	ISO(I)	5.0 OFF	DES(I)	12.0 OFF

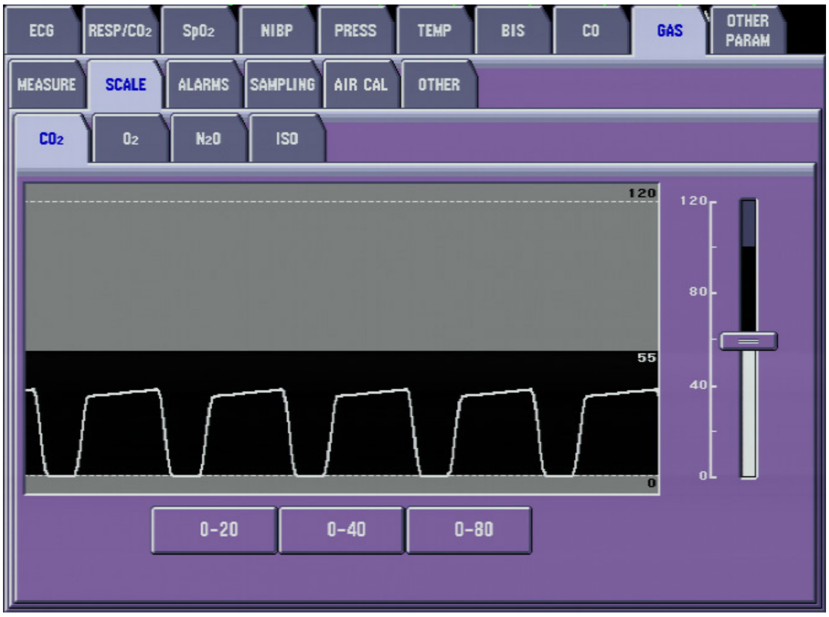
CO2(E) [mmHg] 39

ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MEASURE
SCALE
ALARMS
SAMPLING
AIR CAL
OTHER
100
50
0
OFF
OFF

This setting is not available when using a Dräger Medical Primus/Fabius® anesthesia workstation.

Set the upper and lower CO_2, O_2, N_2O, anesthetic agent, respiration rate and apnea alarm limits.

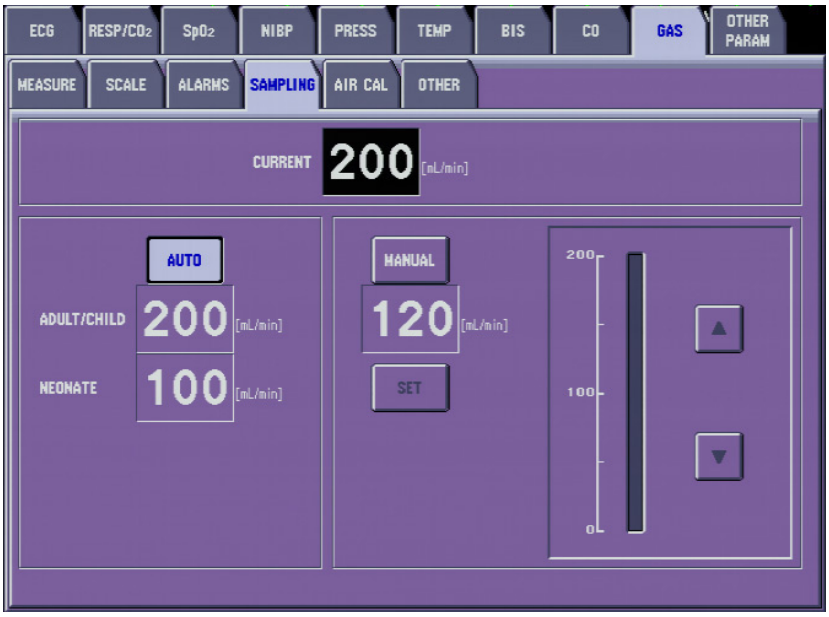
On the SCALE Page



ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MEASURE
SCALE
ALARMS
SAMPLING
AIR CAL
OTHER
CO2
O2
N2O
ISO
120
55
0
120
80
40
0
0-20
0-40
0-80

Select the scale for the CO_2, O_2, N_2O and agent waveforms when using a multigas unit or the CO_2, FLOW and Paw waveforms when using a Dräger Medical Primus/Fabius® anesthesia workstation. The same scale is used on both the home screen and GAS window.

On the SAMPLING Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MEASURE
SCALE
ALARMS
SAMPLING
AIR CAL
OTHER
AUTO
MANUAL
SET
200
100
0
▲
▼

CURRENT 200 [mL/min]

ADULT/CHILD 200 [mL/min]

NEONATE 100 [mL/min]

MANUAL 120 [mL/min]

This setting is not available when using a GF-210R multigas unit, GF-220R multigas/flow unit or Dräger Medical Primus/Fabius® anesthesia workstation.

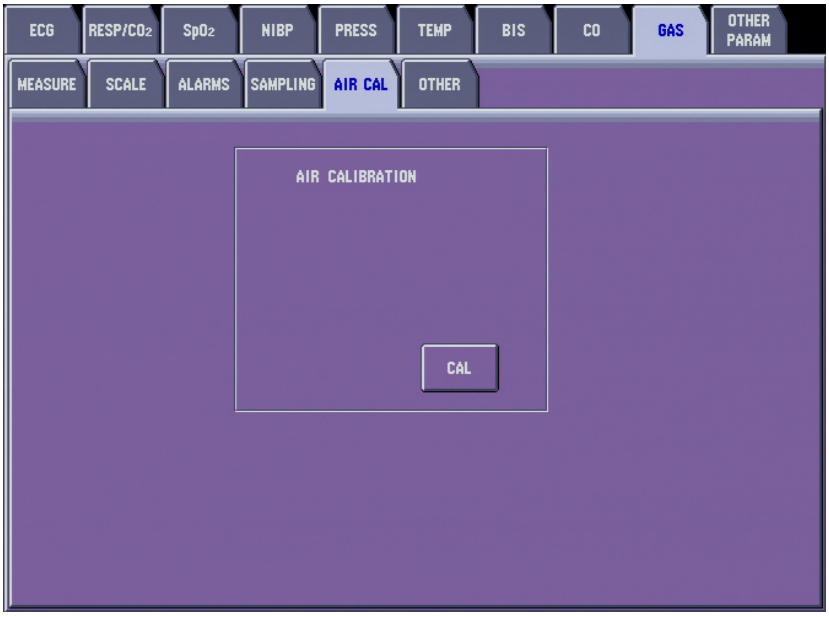
There is auto mode and manual mode for the sampling rate. The default setting is AUTO.

AUTO: Sampling volume is 200 mL/min when a water trap for adult is connected to the multigas unit. Sampling rate is 100 mL/min when a water trap for neonate is connected to the multigas unit.
MANUAL: You can select from 120 to 200 mL/min in 5 mL/min steps when a water trap for adult is connected to the multigas unit.

You can select from 70 to 120 mL/min in 5 mL/min steps when a water trap for neonate is connected to the multigas unit.

If a value outside this range is set, the mode changes to AUTO.

On the AIR CAL Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MEASURE
SCALE
ALARMS
SAMPLING
AIR CAL
OTHER
AIR CALIBRATION
CAL

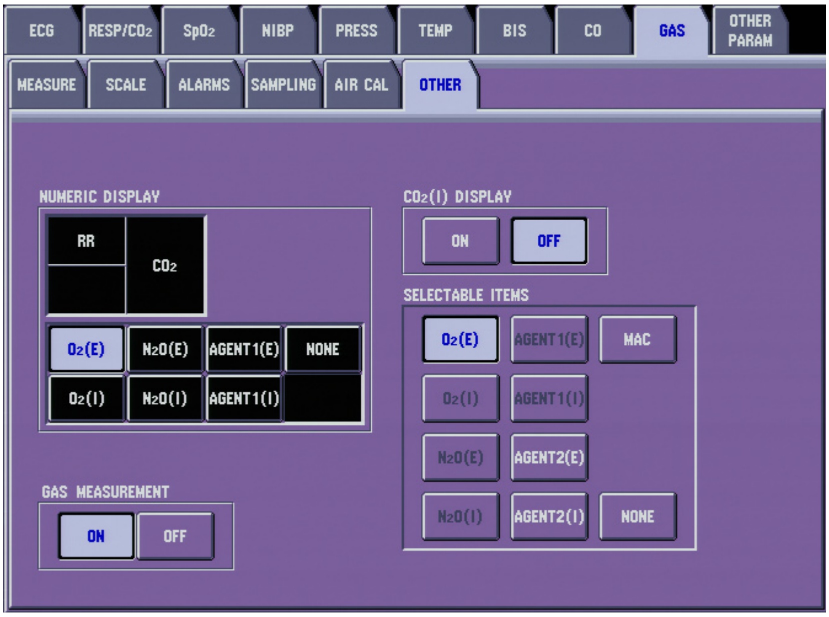
This setting is not available when using a Dräger Medical Primus/Fabius® anesthesia workstation.

For stable measurement accuracy, perform gas calibration every year and whenever you suspect the monitor is not reading correctly.

The monitor periodically performs air calibration. Manually perform the air calibration when inappropriate measurement data appears and before performing gas calibration. It takes about 5 seconds (GF-110PA, GF-120PA) or about 60 seconds (GF-210R, GF-220R) for the air calibration to complete.

Touch the CAL key. Calibration is complete when the “CALIBRATING” message disappears.

On the OTHER Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MEASURE
SCALE
ALARMS
SAMPLING
AIR CAL
OTHER
NUMERIC DISPLAY
RR
CO2
O2(E)
N2O(E)
AGENT1(E)
NONE
O2(I)
N2O(I)
AGENT1(I)
CO2(I) DISPLAY
ON
OFF
SELECTABLE ITEMS
O2(E)
AGENT1(E)
MAC
O2(I)
AGENT1(I)
N2O(E)
AGENT2(E)
N2O(I)
AGENT2(I)
NONE
GAS MEASUREMENT
ON
OFF

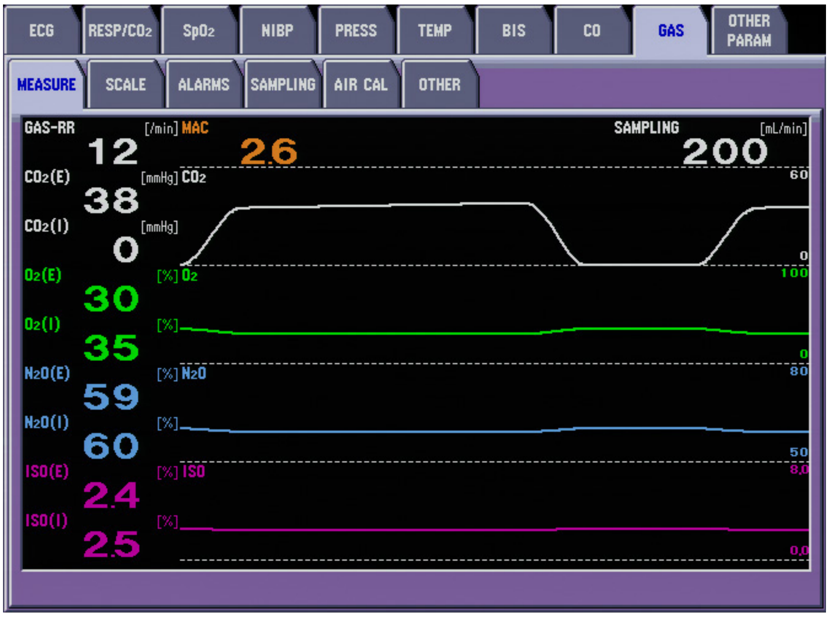
This setting is not available when using a Dräger Medical Primus/Fabius® anesthesia workstation.

Select the parameters to display on the home screen from <SELECTABLE ITEMS> box. RR and CO_2(E) are always displayed.

CO_2(I) display can be turned off independently of other items when LAYOUT page of the SYSTEM window in the SYSTEM SETUP window is set to “SIDE + SMALL BOTTOM” or “SIDE + LARGE BOTTOM”.

Gas measurement can be turned off only when using a GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit.

On the MEASURE Page


ECG
RESP/CO2
SpO2
NIBP
PRESS
TEMP
BIS
CO
GAS
OTHER PARAM
MEASURE
SCALE
ALARMS
SAMPLING
AIR CAL
OTHER
GAS-RR
[/min]
MAC
12
2.6
SAMPLING
[mL/min]
200
CO2(E)
[mmHg] CO2
38
60
CO2(I)
[mmHg]
0
0
O2(E)
[%] O2
30
100
O2(I)
[%]
35
0
N2O(E)
[%] N2O
59
80
N2O(I)
[%]
60
50
ISO(E)
[%] ISO
24
8.0
ISO(I)
[%]
25
0.0

After completing the preparation, gas data and waveforms appear on the screen.

NOTE:

- The gas monitoring starts about 45 seconds (AG-920R, GF-110PA, GF-120PA) or 1 minute (GF-210R, GF-220R) after the [MEASURE] lamp on the multigas unit lights. The measurement accuracy is guaranteed for about 10 minutes (AG-920R, GF-110PA, GF-120PA) or 6 minutes (GF-210R, GF-220R) after the [MEASURE] lamp lights.
- Inspired and expired values are not displayed soon after starting monitoring. These values stabilize after the respiration rate appears on the screen.

Auto Calibration

Using AG-920R or GF-110PA Multigas Unit or GF-120PA Multigas/Flow Unit

The monitor periodically performs air calibration at the following intervals. Manually perform the air calibration when inappropriate measurement data appears and before performing air calibration. It takes about 5 seconds for the air calibration to complete.

5 minutes after power on:	30 to 100 seconds
5 to 60 minutes after power on:	2 to 15 minutes
1 to 2 hours after power on:	30 minutes
More than 2 hours after power on:	4 hours

Using GF-210R Multigas Unit or GF-220R Multigas/Flow Unit

The monitor performs the air calibration every 2 hours when the multigas unit is in the steady state. Manually perform the air calibration when inappropriate measurement data appears. It takes about 1 minute for the air calibration to complete.

Inspection of Measuring Accuracy

CAUTION

When the monitoring value is not appropriate, perform gas calibration. Perform gas calibration once a year for stable measuring accuracy.

The inspection of measuring accuracy must be performed by qualified service personnel.

O$_2$

Preparation

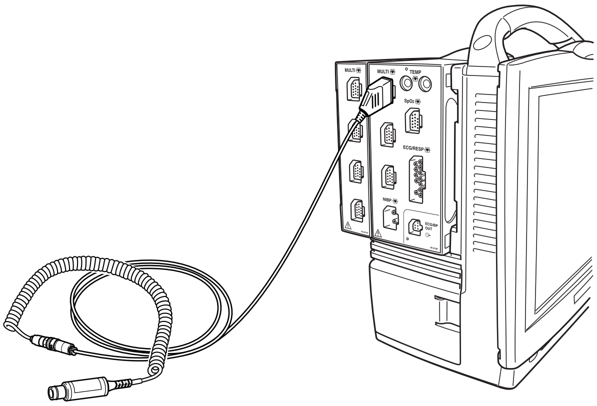
The following items are necessary for O$_2$ monitoring.

- Oxygen sensor, 074705
- T-shaped adapter, 110774
- FiO$_2$ connection cord, JO-900P

NOTE: O$_2$ cannot be monitored by using the MULTI socket on the AY-660P input unit.

CAUTION

The oxygen sensor must be stored with the detector facing down because the detector gets dry and FiO$_2$ monitoring cannot be performed properly. If the detector is dry, the oxygen sensor must be left with the detector facing down for 1 or 2 minutes. If the filter is completely dry, the oxygen sensor must be left with the detector facing down for more than 12 hours.



Connect the oxygen sensor to the FiO$_2$ connection cord and FiO$_2$ connection cord to the unit.

Calibrating the O$_2$ Sensor

Before attaching the oxygen sensor to the patient's inspiration circuit, calibrate the oxygen sensor.

Calibration can be performed in two ways: calibration with air and calibration with 100% O$_2$ gas. Both methods are performed on the O$_2$ window.

- Calibration with air (21% O$_2$)
  1. Leave the oxygen sensor in the atmosphere for more than 1 minute.
  2. Display the MAIN page of the O$_2$ window
     Press [Menu] key → O$_2$ key → MAIN tab.
  3. Touch the AIR CAL key.
  4. When the "EXPOSE SENSOR TO AIR" message is displayed, touch the YES key to start calibration. When the calibration is complete, the calibration date and time, and the O$_2$ value "21" are displayed on the O$_2$ window.

- Calibration with 100% O$_2$
  1. Apply 100% O$_2$ flow to the oxygen sensor for more than 1 minute.
  2. Display the MAIN page of the O$_2$ window
  3. Touch the O$_2$ CAL key.
  4. When the "FLOW CALIBRATION GAS" message is displayed, touch the YES key to start calibration. When the calibration is complete, the calibration date and time, and the O$_2$ value "100" are displayed on the O$_2$ window.

After calibration, attach the oxygen sensor to the patient's inspiration circuit. Connect the T-shaped adapter to the inspiration circuit of the respirator, with the detector of the oxygen sensor facing down and the oxygen sensor at an inclination angle within 45° from the respirator vertically.

NOTE:

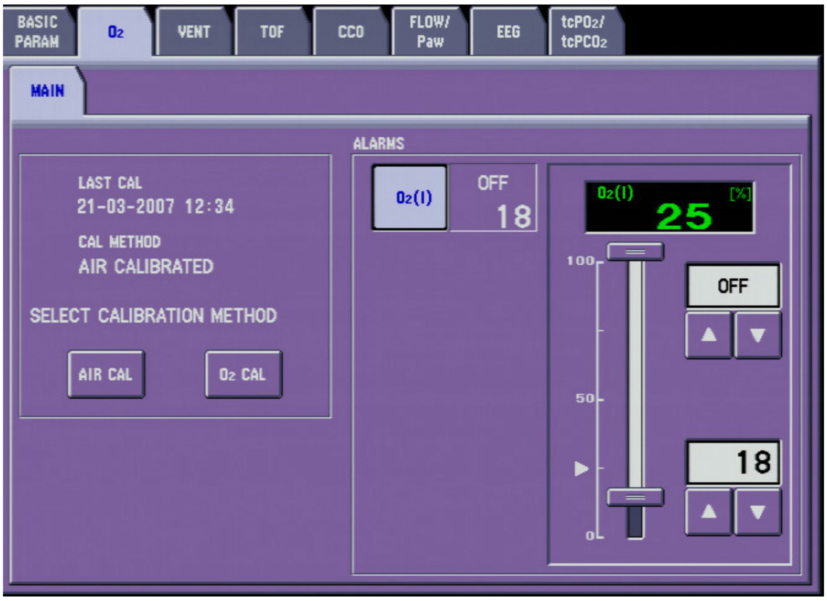
- Connect the detector of the oxygen sensor facing down. Otherwise, the oxygen sensor function deteriorates and considerable errors in the measured value may occur.
- Do not connect the oxygen sensor where inspiration and expiration gas mix. The oxygen sensor cannot respond to each respiration.

Changing O_2 Settings

Change the alarm settings on the O_2 window.

The O_2 data display color can be set on the SYSTEM SETUP window.

On the MAIN Window


BASIC PARAM
O2
VENT
TOF
CCO
FLOW/ Paw
EEG
tcPO2/ tcPCO2
MAIN
ALARMS
AIR CAL
O2 CAL
O2(I)
OFF
18
O2(I)
[%]
25
100
50
0
OFF
18

LAST CAL
21-03-2007 12:34

CAL METHOD
AIR CALIBRATED

SELECT CALIBRATION METHOD

O_2 alarm limits: Set the upper and lower O_2 alarm limits.

Other Parameters

The following parameters can be monitored on the BSM-6301, BSM-6501 or BSM-6701 bedside monitor when optional units and connection cables are installed.

WARNING

When connecting an external instrument using an interface or communication cable to the monitor, some alarms and messages from the external instrument might not be displayed on the monitor. When the waveform or data is abnormal, check the alarm and message on the external instrument.

CO_2 Sidestream

WARNING

Alarms are set on the bedside monitor and Microcap® monitor individually. When an alarm setting is changed on one instrument, the same setting change is not automatically applied to the other instrument.

CO_2 monitoring in sidestream method is available with the AG-400R CO_2 unit.
NOTE: AG-400R CO_2 unit is not available for BSM-6000A series.

CO_2 monitoring in sidestream method is available with the Oridion portable bedside monitor Microcap®.
NOTE: Oridion portable bedside monitor Microcap® is not available for BSM-6000K series.

Gas

Gas monitoring is available with the AG-920R, GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit.
Gas monitoring is also available with the Dräger Medical Primus/Fabius® anesthesia workstation.
NOTE: GF-210R multigas unit and GF-120PA or GF-220R multigas/flow unit are not available for BSM-6000A series.

BIS

BIS monitoring is available with the Aspect's BIS monitor.

TOF

TOF monitoring is available with the Organon's TOF-Watch® SX neuromuscular transmission monitor.

Ventilator

Ventilator monitoring is available with the Dräger ventilators, Puritan Bennett ventilators, MAQUET ventilators or Hamilton Medical ventilators.

CCO/PCCO

CAUTION

Connect the PiCCO monitor to the BSM-6000 series bedside monitor using only the QF-911P interface. Do not connect the instruments using any other interface or cable. Otherwise, the measurement accuracy becomes out of range.

CCO monitoring is available with the Edwards Lifesciences Vigilance CCO monitor.

PCCO monitoring is available with the Pulsion Medical Systems PiCCO monitor.

CCO/$S\bar{v}O_2$

CCO/$S\bar{v}O_2$ monitoring is available with the Hospira SO_2/CCO monitor.

FLOW/Paw

NOTE: GF-120PA and GF-220R multigas/flow unit is not available for BSM-6000A series.

FLOW/Paw monitoring is available with the GF-120PA multigas/flow unit.

EEG

EEG monitoring is available with the AE-918P neuro unit.

NOTE: AE-918P neuro unit is not available for BSM-6000A series.

WARNING

When using the JE-905P EEG connection cord, bundle all unused electrode leads. When using the JE-906P EEG connection cord, disconnect all unused electrode from the EEG connection cord. If the unused electrode or electrode lead touches a metal object or any other conductive parts, the patient may receive electrical shock.

WARNING

When using the JE-906P EEG connection cord and the bedside monitor is connected to a central monitor network, EEG values and waveforms are not output to the central monitor from the bedside monitor. No data or alarm regarding the EEG data from the neuro unit are displayed on the central monitor. Be careful on EEG monitoring when the bedside monitor is connected to a central monitor network.

WARNING

When abnormal waveforms appear (flat waveform or a lot of AC interference), remove all electrodes from the patient and stop using the neuro unit.

CAUTION

Do not use the needle electrodes for more than one hour as a measurement electrode for the EEG. When measuring the EEG for over one hour, use the EEG disk electrode.

CAUTION

Never check the skin-electrode impedance with the needle electrode inserted in the patient. Failure to follow this caution causes electrical burn where electrodes are inserted.

$tcPO_2$/$tcPCO_2$

Transcutaneous blood gas monitoring is available with the Radiometer transcutaneous monitor.

Screen Messages

The messages displayed when using this monitor are listed in alphabetical order. Each message is followed by the corresponding cause and countermeasure.

An item with an asterisk (*) in the left column is an alarm.

NOTE: If the problem cannot be solved after performing the countermeasure, contact your Nihon Kohden representative.

Screen Message		Parameter	Possible Cause/Criteria	Action
*	– – – ALARM	All parameters	Alarm concerning the – – – (parameter name) occurred.	Take appropriate action depending on the alarm level. (Displaying the home screen may display the alarm in detail.)
–	Bed name INTERBED ALARM	All parameters	Alarm occurred on an interbed bed of the bed name.	Check the data of the alarmed bed on the INTERBED window and remove the cause.
–	ALARM SILENCED	All parameters	The [Silence Alarms] key was pressed to silence the alarm.	• When the alarm cause is resolved, the alarm is cleared. • When the [Silence Alarms] key is pressed during alarm silence, all alarms are resumed.
–	ALARMS SUSPENDED	All parameters	The [Silence Alarms] key was pressed before alarm occurrence.	To cancel alarm suspension, press the [Silence Alarms] key again.
–	ALARMS SUSPENDED – min	All parameters	The SUSPEND MONITORING key was touched.	All alarms resume when the SUSPEND MONITORING or SUSPEND ALARMS key is touched again during alarm suspension.
			The SUSPEND ALARMS key was touched.	
–	ALL ALARMS OFF	All parameters	The BYPASS key or ALL ALARMS OFF key is touched to suspend alarm function.	To resume alarm function, touch the BYPASS or ALL ALARMS OFF key.
–	ARRHYTHMIA ANALYSIS OFF	ECG	<ARRHYTHMIA ANALYSIS> on the SYSTEM SETUP window is set to OFF.	If arrhythmia analysis is necessary, set <ARRHYTHMIA ANALYSIS> on the SYSTEM SETUP window to ON.
*	BATTERY ERROR	System	Battery problems.	Contact your Nihon Kohden representative.
*	BATTERY WEAK	System	Remaining battery is less than 25%.	Switch to AC power and charge the battery pack.
*	BIS CHECK EXTERNAL DEVICE	BIS (BIS monitor)	The BIS monitor is disconnected from the bedside monitor.	Check the interface connection between the BIS monitor and bedside monitor.
*	BIS CHECK SENSOR	BIS (BIS processor/ BISx)	The BIS sensor is detached from the patient.	Attach the BIS sensor to the patient properly.
			The BIS sensor is disconnected from the PIC Plus patient interface cable.	Connect the BIS sensor to the PIC Plus patient interface cable properly.
			The PIC Plus patient interface cable is disconnected from the BIS processor.	Connect the PIC Plus patient interface cable to the BIS processor properly.
			The impedance between the BIS sensor and skin is too high.	Check the BIS sensor attachment and remove the cause. If necessary, replace it with a new one. Use only the specified BIS sensor.
*	BIS CONNECTOR OFF	BIS (BIS processor/ BISx)	The BIS processor is disconnected from the connection cord or the connection cord is disconnected from the monitor.	Check that the BIS processor is firmly connected to the connection cord and connection cord is firmly connected to the monitor.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	BIS HIGH IMPEDANCE	BIS (BIS processor/ BISx)	The impedance between the BIS sensor and skin is too high.	Check the BIS sensor attachment and if necessary, replace it with a new one.
–	BIS CHECKING IMPEDANCE	BIS (BIS processor/ BISx)	The impedance of the BIS sensor is being checked.	Wait until the impedance check is complete.
*	BIS MODULE FAILURE	BIS (BIS processor/ BISx)	Faulty BIS processor.	Contact your Nihon Kohden representative.
–	BIS NOISE	BIS (BIS processor/ BISx)	Noise interference.	Check the BIS sensor attachment. If necessary, replace the sensor with a new one.
*	BIS SENSOR ERROR	BIS (BIS processor/ BISx)	The BIS sensor failure.	Display the BIS window and touch the RESET key after replacing the BIS sensor with a new one.
*	BIS SENSOR EXPIRED	BIS (BIS processor/ BISx)	BIS sensor is past its expiration date.	Replace the BIS sensor with a new one.
*	CCO ALARM	CCO CCO/$S\bar{v}O_2$	Alarm occurring on the CCO monitor.	Check the CCO monitor and remove the cause of the alarm.
*	CCO CHECK EXTERNAL DEVICE	CCO CCO/$S\bar{v}O_2$	The CCO monitor is disconnected from the bedside monitor.	Check the interface connection between the CCO monitor and the bedside monitor.
*	CLOCK IC FAILURE	System	The clock circuit is damaged.	Contact your Nihon Kohden representative.
–	CLOSE PAPER MAGAZINE	Recording	The recorder door is open.	Push the recorder door closed until it clicks.
–	CO BASELINE DRIFT	CO	Physiological change.	Increase the injectate volume or cool the injectate.
			Using a respirator.	Adjust the respiration phases.
			Injection interval is short.	Increase the injection interval.
			Noise interference from external devices.	Place external devices as far as possible from the catheter.
*	CO CHECK SENSOR	CO	The catheter is not connected to the CO connection cord.	Connect the catheter to the CO connection cord properly.
			The catheter is faulty.	Replace the catheter with a new one.
			The CO connection cord is damaged.	Replace the CO connection cord with a new one.
*	CO CONNECTOR OFF	CO	The CO connection cord is disconnected from the monitor.	Connect the connection cord properly. When CO monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The CO connection cord is damaged.	Replace the CO connection cord with a new one.
–	CO DETECTING BASELINE	CO	Searching for the baseline of the blood temperature.	Wait for the baseline of the blood temperature to be detected.
–	CO INJECT	CO	Injectate is not injected or the monitor does not acknowledge that injectate is injected.	Inject the injectate. The monitor has not acknowledged the injection if the “MEASURING CO” message is not displayed on the CO window even when the injectate is injected. Inject the injectate again.
–	CO INJECTION TIME OUT	CO	Injectate is not detected within 4 minutes after the “INJECT” message was displayed (or 30 seconds after the MANUAL key is pressed).	Touch the MANUAL key and inject the injectate within 30 seconds.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	CO MEASURING CO	CO	Measuring the CO.	Wait for the calculation to be completed.
–	CO OUT OF RANGE	CO	Calculated a value outside the measuring range.	If the catheter retaining condition is not appropriate, the temperature change becomes small and the CO value may be outside the measuring range. Check the catheter retaining condition and the coefficient value setting.
			The coefficient value of the injectate temperature is not specified by the catheter manufacturer.	Make sure the injectate temperature is within the range specified by the manufacturer. For example, when using a Becton Dickinson catheter, the coefficient values for the injectate temperature between 5 and 18°C are not specified so do not use an injectate temperature between 5 and 18°C.
–	CO Tb TEMP ERROR	CO	The blood temperature is below 15°C or above 45°C.	—
			The catheter is faulty.	Replace the catheter with a new one.
–	CO THERMODILUTION CURVE ERROR	CO	Returned to the baseline of the thermodilution curve too late.	Use the appropriate injection method.
			Possible endocardial shunt.	Check the accuracy of the measured value.
–	CO Ti TEMP ERROR	CO	The injectate is not cooled or the room temperature is above 27°C.	Cool the injectate or decrease the room temperature.
			The bath probe or inline sensor is faulty.	Replace the probe or sensor with a new one.
*	CO_2 APNEA	CO_2	Apnea exceeded the apnea alarm limit.	—
–	CO_2 CAL?? (when using TG-950P/970P CO_2 sensor kit)	CO_2	Zero calibration is not performed.	Perform zero calibration.
–	CO_2 CAL COMPLETE	CO_2	Calibration is complete.	—
–	CO_2 CAL ERROR	CO_2	Calibration failed.	Calibrate again. If the problem still occurs, contact your Nihon Kohden representative.
*	CO_2 CHANGE ABSORBENT	CO_2 Sidestream	The CO_2 absorbent needs to be replaced.	Contact your Nihon Kohden representative.
*	CO_2 CHANGE ADAPTER	CO_2	The CO_2 adapter is damaged.	Replace the CO_2 adapter with a new one.
*	CO_2 CHECK SENSOR	CO_2 Mainstream	Insufficient sensor light.	Refer to the CO_2 sensor kit manual. If necessary, replace the kit with a new one.
*	CO_2 CHECK EXTERNAL DEVICE	CO_2 Microcap®	The QF-921P interface is disconnected from the bedside monitor or Microcap® monitor.	Check all cable connections between the Microcap® monitor and bedside monitor.
		CO_2 Sidestream	The AG-400R CO_2 unit is disconnected from the bedside monitor.	Check the interface connection between the AG-400R CO_2 unit and bedside monitor.
*	CO_2 DEVICE ERROR	CO_2 Microcap®	The Microcap® monitor or QF-921P interface failure.	Contact your Nihon Kohden representative.
			Communication error between the Microcap® monitor and bedside monitor.	

Screen Message		Parameter	Possible Cause/Criteria	Action
*	CO$_2$ CONNECTOR OFF	CO$_2$ Mainstream	The CO$_2$ sensor kit is disconnected from the monitor.	Connect the CO$_2$ sensor kit properly. When CO$_2$ monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The CO$_2$ sensor kit is damaged.	Replace the CO$_2$ sensor kit with a new one.
*	CO$_2$ DEVICE ERROR	CO$_2$ Sidestream	CO$_2$ unit failure.	Contact your Nihon Kohden representative.
*	CO$_2$ LINE BLOCK	CO$_2$ Sidestream/ Microcap®	The airway adapter, filterline or exhaust gas tube is clogged and CO$_2$ cannot be measured.	Check that there is no clog in the airway adapter, filterline or exhaust gas tube. If necessary, replace with a new one.
				Make sure that the filterline is placed above the airway adapter.
*	CO$_2$ NO FILTERLINE	CO$_2$ Sidestream	The filterline is not connected to the CO$_2$ unit or unspecified tube is connected.	Firmly connect the specified filterline to the CO$_2$ unit.
		CO$_2$ Microcap®	The filterline is not connected to the Microcap® monitor or unspecified tube is connected.	Firmly connect the specified filterline to the Microcap® monitor.
–	CO$_2$ PLEASE WAIT	CO$_2$ Sidestream	Measurement of the sensitivity calibration is completed and calculation is started.	Stop the gas supply and wait for the calculation to complete.
–	CO$_2$ PURGING	CO$_2$ Sidestream/ Microcap®	Purging to remove clog from the sampling path.	When the clog is removed, measurement is possible. If the clog is not removed, the “CO$_2$ LINE BLOCK” message appears. Refer to the “CO$_2$ LINE BLOCK” message.
*	CO$_2$ SENSOR ERROR	CO$_2$ Mainstream	CO$_2$ sensor is damaged.	Replace the CO$_2$ sensor with a new one.
–	CO$_2$ WARMING UP	CO$_2$ Sidestream	The CO$_2$ unit is warming up. Measurement is not possible.	Wait for the message to disappear.
		CO$_2$ Microcap®	The Microcap® monitor is warming up. Measurement is not possible.	
–	CO$_2$ ZERO CALIBRATING	CO$_2$ Microcap®	Auto zero balance adjustment is being performed.	Wait until zero balance adjustment is complete.
–	CO$_2$ ZEROING	CO$_2$ Sidestream/ Mainstream with TG-950P/970P	Zeroing.	Wait for the zeroing to complete.
–	CO$_2$ ZEROING COMPLETED	CO$_2$ (TG-950P/970P only)	Zeroing is complete.	—
–	CO$_2$ ZEROING ERROR	CO$_2$ (TG-950P/970P only)	Zeroing failed.	Perform zeroing again. If the problem still occurs, contact your Nihon Kohden representative.
–	CONNECT INPUT UNIT	System	The input unit is not connected to the main unit or data acquisition unit and the monitor is not ready for monitoring when the transport function is enabled.	Connect the input unit to the main unit or data acquisition unit and authenticate the patient on the SELECT PATIENT DATA window.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	DATA SEND ERROR	System	The network cable is not properly connected to the bedside monitor, hub and central monitor.	Connect the network cable to the bedside monitor, hub and central monitor properly and insert and remove the input unit from the bedside monitor.
			The network cable is damaged.	Replace the network cable with a new one and insert and remove the input unit from the bedside monitor.
			The bedside monitor is not registered as a monitored bed on the central monitor.	Register the bedside monitor on the central monitor as a monitored bed and insert and remove the input unit from the bedside monitor.
–	ECG AUTO LEAD CHANGE	ECG	<AUTO LEAD CHANGE> on the ECG window is set to ON, an electrode of the lead for the first trace was detached for more than 5 seconds and therefore the lead was changed to a stable lead.	Check the electrode attachment.
–	ECG CANNOT ANALYZE	ECG	Noise interference for more than 30 seconds and heart rate cannot be counted and arrhythmia cannot be analyzed.	Remove noise.
*	ECG CHECK ELECTRODES	ECG	The electrode lead is detached from the electrode.	Connect the electrode lead to the electrode firmly.
		ECG	The electrode cannot be attached firmly to the skin.	Replace the electrode with a new one.
		ECG	The electrode lead is disconnected from the ECG connection cord.	Connect the electrode lead to the ECG connection cord.
		ECG	The contact between the lead and electrode is poor.	Clean the electrode lead clip or replace the electrode lead with a new one.
		ECG	<NUMBER OF ELECTRODES> setting on the ECG window is not correct.	Set the correct settings for <NUMBER OF ELECTRODES>.
		ECG	The electrode lead is damaged.	Replace the electrode lead with a new one.
		ECG	Differential offset voltage at electrodes.	Replace the electrode with a new one.
*	ECG CHECK ELECTRODE – –	ECG	Problems at the specified electrode.	Remove the cause by referring to the “ECG CHECK ELECTRODES” message.
–	ECG LEARNING	ECG	Started learning QRS for arrhythmia analysis.	Wait for learning to finish.
*	ECG MODULE ERROR	ECG	Module malfunction.	Contact your Nihon Kohden representative.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	ECG NOISE	ECG	The baseline is not stable due to respiration or body movement.	Change the electrode position.
		ECG	EMG noise is superimposed.	Change the electrode position to where there is less muscle.
		ECG	The electrode is pulled by the lead.	Put some slack into the electrode lead.
		ECG	The electrode is dry.	Replace the electrode with a new one.
		ECG	The contact between the lead and electrode is poor.	Clean the electrode lead clip or replace the electrode lead with a new one.
		ECG	High electrode impedance.	Rub the skin with “skinPure” skin preparation gel.
		ECG	An electric blanket is used.	Use another warming method.
		ECG	Equipment which emits strong electromagnetic interference is nearby. e.g. ESU, cellular phone.	Keep the interference source away from the monitor or turn off the emitter source power.
		ECG	Equipotential grounding is not acquired.	Connect the equipotential ground terminal on the monitor to the equipotential ground terminal on the wall with the grounding lead.
–	ECG PACING (This message appears only when pacing spike detection on the ECG window is set to ON.)	ECG	Paced QRS is detected.	When the patient does not have an implanted cardiac pacemaker, set the pacing spike detection to OFF on the ECG window.
			An electric blanket is used.	Use another warming method.
			ECG of a neonate is monitored.	Set the pacing spike detection to OFF on the ECG window.
–	EEG CALIBRATING	EEG	The CAL key on the EEG window is touched to display the calibration waveforms.	—
*	EEG CHECK ELECTRODES	EEG	The electrode is dry or not attached to the patient.	Attach the electrodes to the patient properly. When using disposable electrodes, replace them with new one.
			The electrode lead is disconnected from the EEG connection cord.	Connect the electrode lead to the EEG connection cord.
			Contact between the electrode lead clip and electrode is poor (when using disposable electrodes).	Replace the EEG electrode lead with a new one.
			The electrode lead is damaged.	Replace the electrode lead with a new one.
			Differential offset voltage at electrodes.	Attach the electrodes to the patient properly. When using disposable electrodes, replace them with new one.
			The electrode impedance is too high.	Clean the attachment site and attach the electrodes again.
			The EEG connection cord is disconnected then connected.	When the EEG connection cord is disconnected and then connected again, this message may appear. Press the [Silence Alarms] key to clear the message.
*	EEG CHECK EXTERNAL DEVICE	EEG	The neuro unit is disconnected from the bedside monitor.	Check the cable connection between the units.
–	EEG CHECKING IMPEDANCE	EEG	Checking electrode impedance.	—
*	EEG CONNECTOR OFF	EEG	The EEG connection cord is disconnected from the neuro unit.	Connect the EEG connection cord to the neuro unit. When EEG monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The EEG connection cord is damaged.	Replace the EEG connection cord with a new one.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	EEG HIGH IMPEDANCE	EEG	The electrode impedance is too high.	Clean the attachment site and attach the electrodes again.
–	EEG RESETTING BASELINE	EEG	The RESET key on the EEG window is touched to return all EEG waveforms to the baseline position.	—
*	FLOW APNEA	FLOW/Paw	Apnea exceeded the apnea alarm limit.	—
–	FLOW CAL COMPLETE	FLOW/Paw	Zero calibration is complete.	—
–	FLOW CAL ERROR	FLOW/Paw	There was vibration during calibration and zeroing failed.	If the message appears several times, contact your Nihon Kohden representative.
			Nearby device was generating a strong noise during calibration and zeroing failed.	
*	FLOW CONNECTOR OFF	FLOW/Paw	Faulty flow tube.	Replace the flow tube with a new one.
			The flow tube is disconnected from the unit.	Connect the flow tube to the unit securely.
*	FLOW CHECK EXTERNAL DEVICE	FLOW/Paw	Measure switch on the unit is turned off.	Turn on the measure switch on the unit.
			The connection cable is disconnected from the monitor.	Check the connection between the unit and the monitor.
			An error occurs in the communication between the unit and monitor.	Remove the connection cable from the monitor and connect it again. If the problem still occurs, contact your Nihon Kohden representative.
		FLOW/Paw GF-220PA	The power cord is disconnected.	Check the power cord is securely connected.
		FLOW/Paw	<FLOW/Paw MEASUREMENT> on the FLOW/Paw window is OFF.	Set the <FLOW/Paw MEASUREMENT> on the FLOW/Paw window to ON.
*	FLOW EXTERNAL DEVICE ERROR	FLOW/Paw	Faulty unit.	Contact your Nihon Kohden representative.
–	FLOW OUT OF RANGE	FLOW/Paw	The measured value is outside the measurable range.	Replace the flow tube and/or flow adapter with a new one. If the problem still occurs, contact your Nihon Kohden representative.
–	FLOW ZERO CALIBRATING	FLOW/Paw	Zero calibration is being performed.	Wait for calibration to complete.
–	FREEZE	All parameters	The waveforms are frozen.	To unfreeze the waveforms: • Press any key on the screen • Press any key on the monitor • The waveforms are unfreezed 3 minutes after freezing
*	GAS APNEA	GAS	Apnea exceeded the apnea alarm limit.	—
–	GAS CALIBRATING	GAS	Air or gas calibration is being performed.	Wait for the calibration to complete.
–	GAS CAL COMPLETE	GAS GF-110PA/120PA GF-210R/220R	Air or gas calibration is complete.	—

Screen Message		Parameter	Possible Cause/Criteria	Action
–	GAS CAL ERROR	GAS	The sampling line or exhaust gas tube is clogged.	Check that the sampling line and exhaust gas tube are not bent or clogged. Replace with a new one if necessary and perform the manual or air calibration. If the problem still occurs, contact your Nihon Kohden representative.
			Contaminated air due to leaking prevented air calibration.	Check that sampling line and respiration circuit are not leaking. After confirming that there are no leaking, ventilate the air around the unit and perform the manual air calibration. If the problem still occurs, contact your Nihon Kohden representative.
		GAS AG-920R GF-110PA/120PA	The pressure in the gas cylinder is less than 0.1 MPa.	If the pressure in the gas cylinder is less than 0.1 MPa, replace with a new calibration gas and calibrate again.
			Correct gas is not used for calibration.	Check that correct gas is used for calibration.
*	GAS CHANGE WATERTRAP	GAS	The water trap is clogged.	Empty the water from the water trap. If the problem still occurs, replace the water trap with a new one.
			The sampling line is clogged.	Check that sampling line is not bent or clogged. Replace with a new one if necessary.
			The exhaust gas tube is clogged.	Check that exhaust gas tube is not bent or clogged. Replace with a new one if necessary.
*	GAS CHECK EXTERNAL DEVICE	GAS	Measure switch on the unit is turned off.	Turn on the measure switch on the unit.
			The connection cable is disconnected from the monitor.	Check the connection between the unit and the monitor.
			An error occurs in the communication between the unit and monitor.	Remove the connection cable from the monitor and connect it again. If the problem still occurs, contact your Nihon Kohden representative. When using an AG-920R multigas unit, refer to the QF-904P interface manual.
		GAS GF-210R/220R	The power cord is disconnected.	Check the power cord is securely connected.
		GAS GF-110PA/120PA GF-210R/220R	<GAS MEASUREMENT> on the GAS window is OFF.	Set the <GAS MEASUREMENT> on the GAS window to ON.
*	GAS CHECK SAMPLE LINE	GAS AG-920R	The sampling gas inlet on the water trap or sampling gas outlet on the rear panel of the unit is pressurized.	Check that the sampling gas inlet or sampling gas outlet of the unit is not pressurized.
*	GAS CHECK WATERTRAP	GAS	The water trap is not attached properly. The sampling line is not connected properly.	Make sure that the water trap is securely attached to the unit. Connect the sampling line properly.
		GAS GF-210R/220R	An unspecified sampling line is used.	Use a specified sampling line.
*	GAS EXTERNAL DEVICE ERROR	GAS	Faulty unit.	Contact your Nihon Kohden representative.

Screen Message		Parameter	Possible Cause/Criteria	Action
*	GAS LINE BLOCK	GAS	The water trap is clogged.	Empty the water from the water trap. If the problem still occurs, replace the water trap with a new one.
			The sampling line is clogged.	Check that sampling line is not bent or clogged. Replace with a new one if necessary.
			The exhaust gas tube is clogged.	Check that exhaust gas tube is not bent or clogged. Replace with a new one if necessary.
*	GAS MIXED GAS	GAS	Two anesthetic agents are detected at the same time when the vaporizer is changed.	When either agent concentration becomes below 0.2% or alarm silences.
			Wrong agent is delivered to the vaporizer.	Contact the anesthetic machine manufacturer.
			Two anesthetic agents are detected when two vaporizers operated at the same time.	
–	GAS OUT OF RANGE	GAS	The measured value is outside the measurable range.	• Check the condition of the patient and anesthetic machine. • Check the connection of the sampling line and respiration circuit. • Remove the connection cable from the monitor and connect it again. If the problem still occurs, contact your Nihon Kohden representative.
			The measurement sensitivity has shifted.	Perform gas calibration with the correct gas.
*	GAS OVERHEAT	GAS GF-210R/220R	Faulty fan.	Contact your Nihon Kohden representative.
–	GAS PURGING	GAS AG-920R	Purging to remove clogging from the sampling line.	Wait for purging to complete.
–	GAS UNSPECIFIED ACCURACY	GAS AG-920R	The measured value is outside the accuracy range.	• Check the condition of the patient and anesthetic machine. • Check the connection of the sampling line and respiration circuit. • Remove the connection cable from the monitor and connect it again. If the problem still occurs, contact your Nihon Kohden representative.
			The measurement sensitivity has shifted.	Peform gas calibration with the correct gas.
–	GAS WARMING UP	GAS	The unit is still warming up.	Wait for warming up to complete.
*	INPUT UNIT DISCONNECT	System	The input unit is disconnected from the main unit or data acquisition unit when the transport function is enabled.	Connect the input unit and authenticate the patient on the SELECT PATIENT DATA window to select the monitoring patient.
*	INPUT UNIT FAILURE	System	Communication error between the input unit and main unit.	Insert and remove the input unit from the bedside monitor. If the problem is not solved, contact your Nihon Kohden representative
			The QM-600P memory unit installed inside the input unit is damaged.	
			The data is sent to a bedside monitor or central monitor which has a different time zone setting and data in the input unit is deleted.	Insert and remove the input unit from the bedside monitor or JA-690PA/694PA data acquisition unit and press the [Silence Alarms] key. Make sure to change the zone setting to the same setting as the other bedside monitors or central monitors.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	INSERT REC PAPER	Recording	No recording paper.	Load the recording paper.
			The recording paper is not loaded correctly.	Correctly load the recording paper.
–	INVALID CARD	System	Invalid SD card is inserted.	Only use the Nihon Kohden specified SD card.
–	MONITOR OFF	All parameters	Monitor cannot access to interbed bed.	The power of interbed bed is off.
				The network cable of interbed bed side is disconnected.
*	MPU MODULE ERROR	All parameters	MPU circuit malfunction.	Contact your Nihon Kohden representative.
*	MULTILINK CONFIG ERROR	All parameters	Communication failure between QF series interface or IF series communication cable and monitor.	Contact your Nihon Kohden representative.
*	MULTILINK POWER ERROR	All parameters	Multi-link power supply failure.	Contact your Nihon Kohden representative.
*	NIBP AIR LEAK	NIBP	The cuff pressure does not change after inflation even after a certain period of time.	Connect the cuff to the air hose properly.
				Connect the air hose to the socket properly.
			The cuff or air hose is damaged.	Replace the cuff or air hose with a new one.
*	NIBP CANNOT DETECT PULSE	NIBP	The patient’s pulse wave is small.	Measure by palpation or the invasive blood pressure method.
			The cuff is not wrapped on the patient correctly.	Wrap the cuff around the arm of the patient properly.
*	NIBP CHECK INTERVAL SETTING	NIBP	NIBP is measured at 1 minute intervals for more than 30 minutes.	Check the patient condition and determine whether to continue measuring NIBP at 1 minute intervals.
*	NIBP CONNECTOR OFF	NIBP	The air hose is disconnected from the monitor.	Connect the air hose properly. When NIBP monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The air hose is damaged.	Replace the air hose with a new one.
*	NIBP CUFF OCCLUSION	NIBP	The cuff pressure does not decrease after measurement has completed.	Check that the air hose is not bent or squeezed.
*	NIBP HIGH CUFF PRESS	NIBP	Enormous pressure was applied by the pressure of the cuff.	When measuring an adult, ask the patient not to move too much.
–	NIBP INFLATION PRESS LOW	NIBP	Insufficient cuff inflation pressure.	Wait until the cuff pressure rises.
*	NIBP MEAS TIMEOUT	NIBP	The measuring time exceeded the specified time due to arrhythmia or noise.	If the cause is arrhythmia, measure by invasive blood pressure measurement. Remove the cause if due to noise.
–	INFLATION TIME PASSED	NIBP	Venous puncture cuff inflation time is exceeded.	Restart venous puncture.
–	NIBP MEASURING NIBP	NIBP	Start venous puncture during NIBP.	Finish the NIBP measurement and restart venous puncture.
*	NIBP MODULE ERROR	NIBP	Module malfunction.	Contact your Nihon Kohden representative.
–	NIBP PLEASE WAIT	NIBP	Measurement started before the cuff inflation pressure was deflated enough.	Check the cuff pressure before starting measurements. When measuring using the adult cuff: below 15 mmHg When measuring using the cuff for neonates: below 3 mmHg

Screen Message		Parameter	Possible Cause/Criteria	Action
–	NIBP REMEASURING (Remeasurement is automatically performed. If the message still appears, after remeasurement, do the counter actions.)	NIBP	The cuff is not attached to the patient.	Attach the cuff to the patient.
			Patient moved during measurement.	Wait for the patient to stop moving, then measure again.
			Patient's pulse is too small.	Measure by palpation or the invasive blood pressure method.
			The cuff is not attached properly.	Attach the cuff properly.
			The cuff size is not appropriate.	Check that the cuff of the correct size is used.
			Patient's pulse and heart rate is unstable.	Wait for the patient to relax and stop moving.
*	NIBP SAFETY CIRCUIT RUNNING (When this message is displayed, measurement cannot be performed for 40 seconds.)	NIBP	The hose is bent.	Check that the hose is not bent.
			The inflation time is too long.	Stop measurement.
			In auto mode measurement, the cuff inflation started before the cuff deflation is complete.	Stop measurement.
*	NIBP SYSTOLIC OVER	NIBP	The maximum blood pressure exceeded 280 mmHg when using the adult cuff, or 150 mmHg when using the neonate cuff.	Measure by palpation or the invasive blood pressure method.
–	NIBP WEAK PULSE	NIBP	The patient's pulse wave is too small.	Measure by palpation or the invasive blood pressure method.
			The cuff is wrapped too loosely.	Wrap the cuff around the arm properly.
			The cuff size is inappropriate.	Use the appropriate cuff.
–	NIBP ZEROING	NIBP	NIBP zero balance adjustment is being performed.	Do not touch the cuff during zeroing and wait for the message to disappear.
–	O_2 CAL??	O_2	The oxygen sensor is not calibrated.	Calibrate the oxygen sensor.
			The oxygen sensor has reached the end of its life.	Replace the oxygen sensor with a new one.
			The oxygen sensor is not connected properly.	Check the connection of the oxygen sensor, wait for more than 1 minute and then calibrate again. If the problem still occurs, replace the oxygen sensor with a new one.
			Calibration is performed when the oxygen sensor is not stable.	
			The calibration mode is not appropriate.	Select the correct calibration mode.
–	O_2 CALIBRATING	O_2	Calibrating the oxygen sensor.	Wait for the calibration to be connected.
*	O_2 CONNECTOR OFF	O_2	The FiO$_2$ connection cord is disconnected from the monitor.	Connect theFiO$_2$ connection cord properly. When O_2 monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The FiO$_2$ connection cord is damaged.	Replace the FiO$_2$ connection cord with a new one.
*	O_2 CHECK SENSOR	O_2	The oxygen sensor is disconnected from the FiO$_2$ connection cord.	Connect the oxygen sensor to the FiO$_2$ connection cord properly.
			The FiO$_2$ connection cord is damaged.	Replace the FiO$_2$ connection cord with a new one.
			The oxygen sensor is damaged.	Replace the oxygen sensor with a new one.
*	PARAMETER NOT AVAILABLE	All parameters	Connected cord or cable of the parameter is not available on the monitor.	—
*	PCCO CHECK EXTERNAL DEVICE	PiCCO	The PiCCO monitor is disconnected from the bedside monitor.	Check the interface connection between the PiCCO monitor and the bedside monitor.

Screen Message		Parameter	Possible Cause/Criteria	Action
*	PRESS CHECK SENSOR	IBP	The blood pressure transducer is disconnected from the IBP connection cord.	Connect the blood pressure transducer to the IBP connection cord properly.
			Malfunction of the blood pressure transducer.	Replace the blood pressure transducer with a new one.
			The IBP connection cord is damaged.	Replace the IBP connection cord with a new one.
*	PRESS CONNECTOR OFF	IBP	The IBP connection cord is disconnected from the monitor.	Connect the IBP connection cord properly. When IBP monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The IBP connection cord is damaged.	Replace the IBP connection cord with a new one.
–	PRESS OUT OF RANGE	IBP	The measured value is outside the measuring range.	Check the measuring environment.
			Malfunction of the blood pressure transducer.	Replace the blood pressure transducer with a new one.
*	PRESS THIS LABEL IS ALREADY REGISTERED	IBP	More than one IBP connection cord with the same label are used.	Set another label.
–	PRESS ZERO CALIBRATING	IBP	Zero balance adjustment is performed.	Wait for the zero balance adjustment to complete.
–	PRESS ZERO IMBALANCE	IBP	Zero balance is not adjusted.	Adjust the zero balance.
–	PRESS ZERO OUT OF RANGE	IBP	Malfunction of the blood pressure transducer.	Replace the blood pressure transducer with a new one.
			Monitor malfunction.	Contact your Nihon Kohden representative.
–	PRESS ZERO UNSTABLE	IBP	The circuit is not exposed to air during zero balance adjustment.	Expose the circuit to air and perform zero balance adjustment again.
			The pressure of zero balance is unstable.	Re-connect the circuit and perform zero balance adjustment again.
–	PRESS ZEROING COMPLETE	IBP	Zero balance adjustment is complete.	IBP monitoring is available.
*	PRINT ERROR	Print	Too many print commands are sent to the network printer.	Wait a while and print again.
			Printer settings are not correct.	Correctly set the printer setting on the PRINTER window on the SYSTEM CONFIGURATION screen.
			The recording paper is not loaded correctly.	Correctly load the recording paper.
–	PRINTING	System	Data is sent to the network printer.	—
*	RESP CHECK SENSOR	RESP (Thermistor)	The respiration pickup is damaged.	Replace the respiration pickup with a new one.
*	RESP CONNECTOR OFF	RESP (Thermistor)	The respiration pickup is disconnected from the monitor.	Connect the respiration pickup properly. When respiration monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The respiration pickup is damaged.	Replace the respiration pickup with a new one.
–	RESP OFF	RESP (Impedance)	<IMP RESP MEASURE> on the RESP/CO_2 window is set to OFF.	When monitoring respiration by impedance method is necessary, set <IMP RESP MEASURE> to ON.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	SENDING DATA	System	The input unit is removed from a bedside monitor and connected to another bedside monitor in a central monitor network. The data of the source bedside monitor is sent to the central monitor.	—
–	SIMULATED DATA	All parameters	The displayed data is simulated data.	To monitor a patient, set <SIMULATION MODE> to OFF on the SYSTEM CONFIGURATION screen. (Administrator setting)
*	SpO$_2$-2 ALARM	SpO$_2$-2 (Nellcor/ Masimo)	Alarm occurring on the pulse oximeter.	Look at the pulse oximeter and remove the cause of the alarm.
*	SpO$_2$ CANNOT DETECT PULSE	SpO$_2$ (NK)	Poor blood circulation for measuring the SpO$_2$ value.	Check the patient condition, probe attachment or change the attachment site.
			The probe is attached too tightly and is obstructing the blood circulation.	Reattach the probe.
			The probe is not attached to the patient properly.	Attach the probe to the patient properly.
			One of the following message is displayed for 30 seconds. • SpO$_2$ LIGHT INTERFERENCE • SpO$_2$ CHECK PROBE SITE • SpO$_2$ DETECTING PULSE	Refer to the each screen message section and remove the cause of the alarm or message.
		SpO$_2$ (Nellcor)	The pulse waveform cannot be detected.	Attach the probe to the patient properly.
*	SpO$_2$-2 CANNOT DETECT PULSE	SpO$_2$ (NK)	Poor blood circulation for measuring the SpO$_2$ value.	Check the patient condition, probe attachment or change the attachment site.
			The probe is attached too tightly and is obstructing the blood circulation.	Reattach the probe.
			The probe is not attached to the patient properly.	Attach the probe to the patient properly.
			One of the following message is displayed for 30 seconds. • SpO$_2$-2 LIGHT INTERFERENCE • SpO$_2$-2 CHECK PROBE SITE • SpO$_2$-2 DETECTING PULSE	Refer to the each screen message section and remove the cause of the alarm or message.
*	SpO$_2$ CHANGE PROBE	SpO$_2$ (NK)	Probe is past its expiration date.	Replace the probe with a new one.
			Probe is damaged or short-circuited.	Replace the probe with a new one.
			SpO$_2$ connection cord is damaged.	Replace the SpO$_2$ connection cord with a new one.
		SpO$_2$ (Masimo)	The monitor cannot identify the connected probe or the probe is broken.	Replace the probe. Refer to the probe manual.
*	SpO$_2$-2 CHANGE PROBE	SpO$_2$ (NK)	Probe is past its expiration date.	Replace the probe with a new one.
			Probe is damaged or short-circuited.	Replace the probe with a new one.
			SpO$_2$ adapter is damaged.	Replace the SpO$_2$ adapter with a new one.
*	SpO$_2$-2 CHECK EXTERNAL DEVICE	SpO$_2$-2 (Nellcor/ Masimo)	The pulse oximeter is disconnected from the bedside monitor.	Check the communication cable connection between the pulse oximeter and bedside monitor.
			Communication error between the bedside monitor and pulse oximeter.	Check the communication settings and the communication cable connection. Refer to the communication cable manual.

Screen Message		Parameter	Possible Cause/Criteria	Action
*	SpO$_2$ CHECK PROBE	SpO$_2$ (NK)	The probe cable is disconnected from the SpO$_2$ connection cord.	Connect the probe cable to the SpO$_2$ connection cord. If SpO$_2$ monitoring is not necessary, press the [Silence Alarms] key.
			The probe is not attached to the patient properly.	Attach the probe to the patient properly.
			The probe is broken or short-circuited.	Replace the probe with a new one. If the message still appears, replace the SpO$_2$ connection cord with a new one.
		SpO$_2$ (Nellcor/ Masimo)	The probe is not attached to the patient properly.	Attach the probe to the patient properly.
*	SpO$_2$-2 CHECK PROBE	SpO$_2$ (NK)	The probe cable is disconnected from the SpO$_2$ adapter.	Connect the probe cable to the SpO$_2$ adapter. If SpO$_2$ monitoring is not necessary, press the [Silence Alarms] key.
			The probe is not attached to the patient properly.	Attach the probe to the patient properly.
			The probe is broken or short-circuited.	Replace the probe with a new one. If the message still appears, replace the SpO$_2$ adapter with a new one.
*	SpO$_2$ CHECK PROBE SITE	SpO$_2$ (NK)	The probe is not attached at the appropriate site.	Attach the probe to a site 6 to 14 mm thick.
			Probe is past its expiration date.	Replace the probe with a new one.
*	SpO$_2$-2 CHECK PROBE SITE	SpO$_2$ (NK)	The probe is not attached at the appropriate site.	Attach the probe to a site 6 to 14 mm thick.
			Probe is past its expiration date.	Replace the probe with a new one.
*	SpO$_2$ CONNECTOR OFF	SpO$_2$ (NK/Nellcor/ Masimo)	The probe cable is disconnected from the SpO$_2$ connection cord.	Connect the probe cable to the SpO$_2$ connection cord. If SpO$_2$ monitoring is not necessary, press the [Silence Alarms] key.
			The SpO$_2$ connection cord is disconnected from the SpO$_2$ socket.	Connect the SpO$_2$ connection cord properly. When SpO$_2$ monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
		SpO$_2$ (Masimo)	The probe is not connected to the patient cable correctly.	Connect the probe to the patient cable with the logo labels facing the same direction.
			The monitor cannot identify the connected probe.	Replace the probe. Refer to the probe manual.
*	SpO$_2$-2 CONNECTOR OFF	SpO$_2$ (NK)	The probe cable is disconnected from the SpO$_2$ adapter.	Connect the probe cable to the SpO$_2$ adapter. If SpO$_2$ monitoring is not necessary, press the [Silence Alarms] key.
			The SpO$_2$ adapter is disconnected from the SpO$_2$ socket.	Connect the SpO$_2$ adapter properly. When SpO$_2$ monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	SpO$_2$ DETECTING PULSE	SpO$_2$ (NK/Nellcor/ Masimo)	Searching for the correct pulse wave.	Wait until the pulse wave is detected.
			The probe is not attached to the patient properly.	Attach the probe to the patient properly.
		SpO$_2$ (NK)	The SpO$_2$ value cannot be obtained because the waveform is unstable.	Check the probe attachment.
			Poor blood circulation for measuring SpO$_2$.	Check the patient condition, probe attachment or change the attachment site.
			The probe is secured too tightly and is obstructing the blood circulation.	Reattach the probe.
			The probe is disconnected from the SpO$_2$ connection cord.	Connect the probe to the SpO$_2$ connection cord.
			The finger probe is not attached to the patient properly.	Attach the finger probe firmly to the patient.
		SpO$_2$ (Nellcor/ Masimo)	The probe attachment site is not appropriate.	Attach the probe to an appropriate place.
–	SpO$_2$-2 DETECTING PULSE	SpO$_2$ (NK)	Searching for the correct pulse wave.	Wait until the pulse wave is detected.
			The probe is not attached to the patient properly.	Attach the probe to the patient properly.
			The SpO$_2$ value cannot be obtained because the waveform is unstable.	Check the probe attachment.
			Poor blood circulation for measuring SpO$_2$.	Check the patient condition, probe attachment or change the attachment site.
			The probe is secured too tightly and is obstructing the blood circulation.	Reattach the probe.
			The probe is disconnected from the SpO$_2$ adapter.	Connect the probe to the SpO$_2$ adapter.
			The finger probe is not attached to the patient properly.	Attach the finger probe firmly to the patient.
*	SpO$_2$-2 ERROR	SpO$_2$-2 (Nellcor/ Masimo)	There is an error on the pulse oximeter.	Look at the pulse oximeter screen and remove the cause of the error.
*	SpO$_2$ LIGHT INTERFERENCE	SpO$_2$ (Masimo)	Too much light on the probe.	Remove light or cover the probe site with blanket.
			Interference from surroundings.	Remove the interference.
			The probe attachment site is not appropriate.	Attach the probe to an appropriate site.
–	SpO$_2$ LOW QUALITY SIGNAL	SpO$_2$ (NK/Nellcor/ Masimo)	Considerable body movement.	When the message is displayed frequently, check the patient condition and, if necessary, change the attachment site.
			The probe is not attached to the patient properly.	
		SpO$_2$ (Nellcor)	Low signal IQ.	When the message is displayed frequently, check the patient condition and, if necessary, change the attachment site.
–	SpO$_2$-2 LOW QUALITY SIGNAL	SpO$_2$ (NK)	Considerable body movement.	When the message is displayed frequently, check the patient condition and, if necessary, change the attachment site.
			The probe is not attached to the patient properly.	
*	SpO$_2$ MODULE ERROR	SpO$_2$ (NK/Nellcor/ Masimo)	SpO$_2$ hardware malfunction.	Turn off the monitor power, wait for a few minutes and turn on the power again. If the message still appears, contact your Nihon Kohden representative.
*	SpO$_2$-2 MODULE ERROR	SpO$_2$ (NK)	SpO$_2$ hardware malfunction.	Turn off the monitor power, wait for a few minutes and turn on the power again. If the message still appears, contact your Nihon Kohden representative.

Screen Message		Parameter	Possible Cause/Criteria	Action
–	SpO_2 WEAK PULSE	SpO_2 (NK/Masimo)	Poor peripheral circulation.	Check the patient condition and change the attachment site.
			The probe is attached too tightly and is obstructing the blood circulation.	Reattach the probe.
		SpO_2 (Masimo)	Low perfusion.	Check the patient condition and change the attachment site.
–	SpO_2-2 WEAK PULSE	SpO_2 (NK)	Poor peripheral circulation.	Check the patient condition and change the attachment site.
			The probe is attached too tightly and is obstructing the blood circulation.	Reattach the probe.
*	$tcPO_2/PCO_2$ ALARM	$tcPO_2/PCO_2$	Alarm occurring on the transcutaneous monitor.	Look at the transcutaneous monitor and remove the cause of the alarm.
*	$tcPO_2/PCO_2$ CHECK EXTERNAL DEVICE	$tcPO_2/PCO_2$	The transcutaneous monitor is disconnected from the bedside monitor.	Check the communication cable connection between the transcutaneous monitor and bedside monitor.
			Communication error between the bedside monitor and transcutaneous monitor.	Check the communication settings and the communication cable connection. Refer to the communication cable manual.
*	TEMP CHECK SENSOR	TEMP	The probe is disconnected from the TEMP socket or temperature connection cord is disconnected from the MULTI socket.	Connect the probe to the TEMP socket or the temperature connection cord to the MULTI socket properly.
			The probe or temperature connection cord is damaged.	Replace the probe or temperature connection cord with a new one.
			The measured value is outside the measuring range.	Check the probe attachment site.
*	TEMP CONNECTOR OFF	TEMP	The temperature connection cord is disconnected from the monitor.	Connect the temperature connection cord properly. When temperature monitoring is not necessary, press the [Silence Alarms] key to silence the alarm.
			The temperature connection cord is damaged.	Replace the temperature connection cord with a new one.
*	TEMP THIS LABEL IS ALREADY REGISTERED	TEMP	More than one temperature probe with the same label are used.	Set another label.
*	TOF CHECK EXTERNAL DEVICE	TOF	The TOF-watch® SX is disconnected from the monitor.	Check the interface connection between the TOF-watch® SX and monitor.
*	TOF ALARM	TOF	There is an error on the TOF-watch® SX.	Check the TOF-watch® SX screen and remove the cause of the error.
*	TRANSMITTER CONNECTOR OFF	System	The connection cord of the transmitter is disconnected from the monitor.	Connect the connection cord properly.
–	UPDATING DATA	All parameters	Changing the parameter on the trend screen.	Wait until the message disappears.
*	VENT ALARM	VENT	Alarm occurring on the ventilator.	Check the ventilator and remove the cause of the alarm.
*	VENT CHECK EXTERNAL DEVICE	VENT	The ventilator is disconnected from the monitor.	Check the interface or communication cable connection between the ventilator and the monitor.

Troubleshooting

Monitoring

Trouble	Possible Cause/Criteria	Action
Cannot turn the power on.	The monitor is not connected to the AC outlet.	Connect the monitor to an AC outlet.
	Monitor malfunction.	Contact your Nihon Kohden representative.
	The remaining battery power is low.	Remove the battery pack and use AC power.
The screen is dark.	The brightness of the screen is not appropriate.	Adjust the setting on the BRIGHT window.
	The backlight is old.	Contact your Nihon Kohden representative.
	The monitor is operating on battery.	If necessary, set <POWER SAVE MODE> to OFF on the GENERAL window.
No sync sound.	The sync sound setting is turned OFF.	Select the ON button of <SYNC SOUND VOLUME>.
	The sync sound volume is turned down.	Adjust the volume setting on the VOLUME window.
	The sleep mode is turned on.	The sleep mode is turned off when: • An alarm occurs • The touch screen is touched • Key on the bedside monitor is pressed
The time displayed on the upper right corner of the screen is not correct.	The date and time setting is not correct.	Set the correct date and time on the DATE window.
	The backup battery is old.	Check the date and time setting on the DATE window and turn the power of the monitor off and on. If the time is incorrect, replace the battery with a new one. Contact your Nihon Kohden representative.
The monitor is too hot.	The vent hole is obstructed.	Remove the cause.
The touch screen keys do not function.	The pressed position and activated position do not match.	Calibrate the touch screen.
The monitor only operates for less than 90 minutes (BSM-6301/BSM-6501) or 60 minutes (BSM-6701) with a fully charged battery.	The battery pack is old.	Replace the battery pack with a fully charged new one.
Some part of the review data is deleted or the time is incorrect.	The monitor was turned off during the system check screen display.	The remaining data may not be reliable. Delete all data.
Three pip sounds and the monitor restarts.	Monitor malfunction.	Contact your Nihon Kohden representative.

Network

Trouble	Possible Cause/Criteria	Action
The monitor cannot be connected to the network.	The network cable is not connected to the monitor properly.	Connect the network cable to the monitor properly.
	The network settings are not correct.	Set the correct network settings on the NETWORK window of the SYSTEM CONFIGURATION screen.
	The monitor is not selected as a monitored bed on the central monitor or receiving instrument.	Select the monitor as a monitored bed on the central monitor or receiving instrument.
	Discontinuity in the network cable or faulty hub.	Replace the network cable or the hub with a new one.

Trouble	Possible Cause/Criteria	Action
The “COMMUNICATION LOSS” message appears and this bedside monitor data cannot be monitored on the central monitor.	The <ARRHYTHMIA TYPE> on the PARAMETERS window of the SYSTEM SETUP window is set to “EXTENDED” on the bedside monitor but the central monitor software is old so that it cannot receive data from this bedside monitor.	To monitor this bedside monitor data on the central monitor, change the <ARRHYTHMIA TYPE> setting to “STANDARD” on the bedside monitor. If possible, upgrade the central monitor software.

Transport

Trouble	Possible Cause/Criteria	Action
Cannot display data saved in the input unit on the destination monitor.	The input unit has no QM-600P memory unit installed.	The QM-600P memory unit must be installed in the input unit to save data.
	The data or memory unit in the input unit is damaged.	Replace the memory unit. Contact your Nihon Kohden representative.
	The software version of the main unit is old and the transport function cannot be used.	To use the transport function, the main unit software version must be 02-01 or later. When transporting data with the BSM-9101 bedside monitor, the BSM-9101 software version must be 08-74 or later.
	The software versions of the original BSM-6000 series bedside monitor main unit and destination BSM-6000 series bedside monitor main unit are different.	Upgrade both the original and destination BSM-6000 series bedside monitor main units to the same software version. To use the transport function, the main unit software version must be 02-01 or later. Contact your Nihon Kohden representative.
Cannot display waveforms on the arrhythmia recall window when transporting data with BSM-9101 bedside monitor.	There is no ECG saved for full disclosure on the BSM-9101 bedside monitor.	ECG must be saved for full disclosure on the BSM-9101 bedside monitor to display arrhythmia recall waveforms when transporting data.
Cannot display waveforms on the full disclosure window.	The original and destination monitors have different parameters to be saved for full disclosure.	Select the same parameters to be saved for full disclosure on the original and destination monitors.
Cannot perform transport function using the central monitor network.	The software versions of the main unit and/or central monitor are old.	Transport function using the network is available with BSM-6000 series bedside monitor software version 02-02 or later and central monitor software version 01-77 or later.
Cannot send review data on the HEMO page of the TREND window, RECALL window and 12 LEAD window to the central monitor.	The software versions of the main unit and/or central monitor are old.	To send the review data on the HEMO page of the TREND window, RECALL window and 12 LEAD window, the BSM-6000 series bedside monitor software version must be 02-03 or later and central monitor software version must be 01-77 or later.
Cannot send review data on the ST window to the central monitor.	The software versions of the main unit and/or central monitor are old.	To send the review data on the ST window, the BSM-6000 series bedside monitor software version must be 02-10 or later and central monitor software version must be 01-77 or later.

Remote Control

Trouble	Possible Cause/Criteria	Action
The remote control does not function.	The batteries in the remote control are old.	Replace the batteries with new ones.
	Wrong bed is selected.	Select the correct remote control channel of the bed.
	The display number on the remote control is not correct.	Select the correct display number.
Nothing appears on the display window of the remote control.	The batteries in the remote control are weak.	Replace the batteries with new ones.
LED on the remote control does not blink or light.	The batteries in the remote control are weak.	Replace the batteries with new ones.

Recording

Trouble	Possible Cause/Criteria	Action
There is no printing (only paper feeding).	The recording paper is upside down.	Reload the recording paper into the recorder correctly.
Recorder operates only some of the time.	Dust in the sensor inside the recorder.	Clean the surface of the sensor inside the recorder with a dry cotton swab.
Recording is faint.	The specified paper is not used.	Use the FQW50-2-100 recording paper.
	The thermal head is dirty.	Clean the thermal head with the thermal head cleaning pen.
Dots are missing.	The thermal head is dirty.	Clean the thermal head with the provided thermal head cleaning pen.
Recording suddenly starts without key operation.	Alarm recording or periodic recording mode is set to ON.	Set the alarm recording or periodic recording on the RECORD window to OFF if not needed. Press the ⌇ [Record] key on the monitor to stop recording.
No paper is feeding.	The recorder door is open.	Push the recorder door closed until it clicks.
	Dust may have collected in the gears.	Contact your Nihon Kohden representative.
Waveforms can be recorded but the trend and list recording cannot.	The recording paper is upside down.	Reload the recording paper correctly.
	Dust in the sensor inside the recorder.	Clean the surface of the sensor inside the recorder with a dry cotton swab.

Printing

Trouble	Possible Cause/Criteria	Action
The monitor cannot be connected to the network printer.	The network cable is not connected to the monitor properly.	Connect the network cable to the monitor properly.
	The printer settings are not correct.	Set the correct settings on the PRINTER page of the RECORD window in the SYSTEM CONFIGURATION screen.

ECG

Trouble	Possible Cause/Criteria	Action
The heart rate is inaccurate.	The QRS amplitude is small.	Change the sensitivity so that the QRS amplitude is larger than 1 cm.
	The QRS is not detected correctly.	Change to a lead which provides good QRS.
		Change the lead or electrode position so that the QRS is large and T wave is small.
	The pacing detection setting on the ECG window is not appropriate.	When the patient does not have an implanted cardiac pacemaker or neonate's ECG is monitored, set the pacing detection to Off on the ECG window.
The arrhythmia alarm occurs frequently when heart rate is normal.	The dominant QRS is not appropriate for arrhythmia monitoring.	Re-learn the patient ECG or change the dominant QRS.
	Patient moved or EMG noise is superimposed.	Change the electrode position to where there is less muscle.
ECG waveform does not appear on the screen when electrodes are attached properly.	<NUMBER OF ELECTRODES> setting on the ECG window is not correct.	Set the correct number for <NUMBER OF ELECTRODES> setting.
AC interference on the ECG waveform.	An electrical blanket is used.	Use another warming method or place a shield cover around the electrical blanket.
	The electrode is dry.	Replace the electrode with a new one.
	<FILTERS> on the ECG window is set to DIAG.	Set <FILTERS> to MONITOR.
Baseline wandering.	The baseline is not stable due to respiration or body movement.	Change the electrode position to where there is less muscle.
	The electrode is dry.	Replace the electrode with a new one.
	The contact resistance between the skin and electrode is high.	Rub the skin with "skinPure" skin preparation gel.
	<FILTERS> on the ECG window is set to MONITOR or DIAG.	Set <FILTERS> to MAXIMUM.

Respiration

Impedance Method

Trouble	Possible Cause/Criteria	Action
The respiration waveform is not displayed on the screen.	<IMPEDANCE MEASUREMENT> on the RESP/CO_2 window is set to OFF.	Set <IMPEDANCE MEASUREMENT> to ON.
	Electrodes, electrode leads, ECG connection cord are not connected correctly.	Connect them properly.
	The electrode is dry.	Replace the electrode with a new one.
	The skin-electrode contact impedance is high.	Reduce the impedance by using “skinPure” skin preparation gel.
The respiration waveform and respiration rate are not stable.	The electrode positions are not appropriate for measuring respiration.	Check the attached position of the electrodes.
	The electrode is dry.	Replace the electrode with a new one.
	<NOISE REDUCTION ON IMPEDANCE RESP> is set to OFF and the respiration waveform amplitude is too small.	Change the sensitivity so that the amplitude is larger than 10 mm.
	<NOISE REDUCTION ON IMPEDANCE RESP> is set to ON and the timing of the respiration and heart rate coincide.	Set <NOISE REDUCTION ON IMPEDANCE RESP> on the SYSTEM SETUP window to ON.
There is sine wave noise on the respiration waveform.	Equipotential grounding is not acquired.	Connect the equipotential ground terminal on the monitor to the equipotential ground terminal on the wall with the grounding lead.

Thermistor Method

Trouble	Possible Cause/Criteria	Action
The respiration waveform is not displayed on the screen.	Malfunction of the respiration pickup.	Replace the respiration pickup with a new one.
The amplitude of the respiration waveform is small or becomes a baseline.	When measuring at the nostrils, the position of the respiration pickup is not appropriate.	Attach the respiration pickup to a position where sufficient temperature changes can be seen.
	The respiration pickup for nose is used for measuring a patient with trachea tube inserted.	Measure with a respiration pickup for airway.
	The temperature difference between inspiration and expiration is small due to increase in temperature of the inspired air.	Use the impedance method.
The expiration and inspiration phases are reversed.	The inspiration temperature is higher than the expiration temperature.	Use the impedance method.
The respiration rate is not accurate.	The respiration waveform amplitude is too small.	Change the sensitivity so that the amplitude is larger than 10 mm.

CO_2

Mainstream Method

Problem	Possible Cause/Criteria	Action
The measured value is low.	CO_2 is mixed in the inspiration. (TG-900P/TG-920P only)	Refer to the CO_2 section.
	The airway adapter/nasal adapter is dirty.	Replace the adapter with a new one.
	The measurement is performed where atmospheric pressure is low, such as at high altitude. (TG-900P/TG-920P only)	Consider the atmospheric pressure when making evaluations.
	Zero calibration is not performed. (TG-950P/TG-970P only)	Calibrate the CO_2 sensor.
The measured value is high (Error is approx. 8 mmHg (1.07 kPa)).	Anesthetic gas is used. O_2: 4 L/min, N_2O: 2 L/min, sevoflurane: 1%	Set the correct inspired gas composition.
The measured value is inaccurate.	Oscillation.	Check the respirator and remove the cause.
	Currently doing suctioning. (TG-900P/TG-920P only)	After completing suction, wait for at least 20 seconds for the correct value to appear.
	A Jackson Rees respiration circuit or Mapleson D respiration circuit is connected to the patient. (TG-900P/TG-920P only)	Cannot measure correctly.
	The respiration rate of the patient is very high or respiration is irregular.	Cannot measure correctly.
The respiration waveform does not appear.	Oscillation.	Check the respirator and remove the cause.
	The airway adapter/nasal adapter is disconnected from the CO_2 sensor kit.	Connect the adapter to the CO_2 sensor kit.
The red LED on the CO_2 adapter blinks.	CO_2 sensor or CO_2 adapter is faulty. (TG-900P/TG-920P only)	Replace the CO_2 sensor or CO_2 adapter with a new one.
	Apnea for longer than 20 seconds. (TG-900P/TG-920P only)	The red LED blinks when apnea is longer than 20 seconds regardless of the alarm setting on the monitor.

Sidestream Method

Trouble	Possible Cause/Criteria	Action
Cannot measure CO_2	The FilterLine is clogged.	Replace the FilterLine with a new one.
	The exhaust gas adapter is clogged.	Remove the clog or replace the exhaust gas adapter with a new one.
	The CO_2 unit is faulty.	Contact your Nihon Kohden representative.
Low CO_2 value	The sample gas is leaking from the FilterLine connector.	Connect the FilterLine properly.
	The sample gas is leaking from the airway adapter.	Replace the airway adapter with a new one.
	The measuring sensitivity is not stable.	Perform CO_2 calibration.
High CO_2 value	The measuring sensitivity is not stable.	Perform CO_2 calibration.
The standby lamp on the CO_2 unit does not light.	The power cord is not connected to the CO_2 unit or AC outlet properly.	Connect the power cord properly. Refer to the AG-400R CO_2 unit manual.
The MEASURE lamp on the CO_2 unit does not light when the MEASURE switch is pressed to on.	The power cord is not connected to the CO_2 unit or AC outlet properly.	Connect the power cord properly. Refer to the AG-400R CO_2 unit manual.
	The interface cable is not connected properly.	Connect the connection cable to the CO_2 unit and bedside monitor properly. Refer to the AG-400R CO_2 unit manual.
	The bedside monitor to which the CO_2 unit is connected is not turned on.	Turn on the bedside monitor power.

When Using Microcap® Monitor

Trouble	Possible Cause/Criteria	Action
The measured value for the Microcap® monitor is not displayed.	The Microcap® monitor is not connected to the bedside monitor.	Connect the Microcap® monitor to the bedside monitor with the QF-921P interface. Refer to the QF-921P interface manual.
	The interface is connected to a wrong socket on the Microcap® monitor.	Connect the interface to the correct socket. Refer to the QF-921P interface manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the QF-921P interface manual.

SpO_2

Trouble	Possible Cause/Criteria	Action
Unstable SpO_2 value.	The probe size is inappropriate.	Use the correct size probe.
	The probe is attached to the same limb that is used for NIBP or IBP measurement.	Attach the probe to the other limb.
	An ESU is used.	Locate the ESU as far as possible from the probe and wait until the pulse wave stabilizes.
	Measuring on the venous pulse.	Cannot measure correctly.
SpO_2 value on the monitor and CO oximeter do not match.	The probe is not attached properly.	Attach the probe correctly. (The emitter and detector of the probe must face each other.)
	The attachment site is inappropriate.	Attach the probe to a site 6 to 14 mm thick.
	The measuring site is not clean.	If necessary, remove nail polish and clean the measuring site.
	Too much abnormal hemoglobin (HbCO, MetHB, etc.).	Cannot measure correctly.
	Dye (methylene blue or indocyanine green) is injected in the blood.	Cannot measure correctly.
	Measuring during CPR.	Cannot measure correctly.
Probe is damaged.	Probe is disinfected by an unspecified procedure.	Disinfect the probe using the specified method.
	The probe is repeatedly used.	Replace the probe with a new one when the expiration date passes.
Sine wave noise on the pulse wave.	Light interference.	Cover the attachment site with a blanket.
	The line frequency setting on the monitor is not correct.	Set the correct line frequency on the monitor.
No SpO_2 data on the screen when using Nellcor probe.	The SpO_2 connection cord other than JL-650P is used.	Only the JL-650P SpO_2 connection cord can be used with Nellcor probe.
No SpO_2 data on the screen when using Masimo probe.	The SpO_2 probe and/or connection cord other than specified is used.	Only use the specified SpO_2 probe and connection cord.
	The probe is not connected to the connection cord correctly.	Connect the probe to the connection cord with the logo labels facing the same direction.
No SpO_2-2 data on the screen when using Nihon Kohden probe.	The JL-500P1 or JL-500P2 SpO_2 adapter is disconnected from the monitor or probe.	Connect the SpO_2 adapter to the monitor and probe.
	The MULTI socket on the AY-660P input unit is used for SpO_2-2 monitoring.	SpO_2-2 cannot be monitored by the MULTI socket on the AY-660P input unit. Use the MULTI socket on the AA-672P or AA-674P smart expansion unit or JA-694PA data acquisition unit.

When Using Nellcor/Masimo Pulse Oximeter

Trouble	Possible Cause/Criteria	Action
The SpO_2 measured values of the pulse oximeter are not displayed.	The pulse oximeter is not connected to the bedside monitor.	Connect the pulse oximeter to the bedside monitor with the communication cable. Refer to the communication cable manual.

NIBP

Trouble	Possible Cause/Criteria	Action
Cuff inflation pressure is less than 10 mmHg or NIBP data display disappears for a few seconds.	The cuff hose is not connected to the cuff socket properly.	Connect the cuff hose to the socket properly.
	The cuff is not wrapped around the arm or is wrapped too loosely.	Wrap the cuff around the upper arm.
The cuff does not inflate when the [NIBP Start/Stop key] is pressed.	The cuff hose is not connected to the cuff socket.	Connect the cuff hose to the socket firmly.
	The cuff hose or air hose may be folded or squeezed when the cuff pressure display on the screen increases quickly but the actual cuff does not inflate.	Check the cuff hose and air hose.
Abnormal measurement results are displayed.	The cuff size is not correct.	Select the cuff which fits the patient's limb circumference.
	The cuff is not wrapped around the arm correctly.	Wrap the cuff around the upper arm, not too tightly or too loosely.
	Body movement.	Prevent the patient from moving during measurement.
	Measurement on the wrong site.	Measure NIBP at the correct site.
The cuff is suddenly deflated during inflation.	The [NIBP Start/Stop] key is pressed during inflation.	——
Auto measurement does not start even when the time interval has passed.	The time interval for the NIBP auto measurement is set incorrectly.	Set the correct time interval.
The cuff suddenly inflates.	The measurement mode is set to auto mode.	Check the time interval.
	NIBP measurement is triggered by PWTT. (PWTT is only available on the AY-660P, AY-661P, AY-663P, AY-671P or AY-673P input unit and SpO_2 is monitored with Nihon Kohden probe.)	Set PWTT on the NIBP window to Off when measuring NIBP with PWTT is not necessary.
Cannot connect cuff to the air hose.	Unspecified cuff is used.	Use a cuff specified by Nihon Kohden.
Cannot measure NIBP.	Noise which disables calculation of the blood pressure has interfered.	Remove the cause.
	The air hose is bent or squeezed.	Remove the cause.
	The cuff has worn out.	Use a new cuff.
Blood congestion occurs.	Measuring over a long period of time at intervals less than 2.5 minutes.	Increase the measuring interval.
		Do not measure NIBP over a long time.
Thrombus occurs.	Measuring a patient with known bleeding disorders or a sickle anemia patient.	Do not perform NIBP measurement on such a patient.
NIBP data on the screen is dark or "---" appears.	The time set at <TIME UNTIL DATA IS OLD> on the SYSTEM SETUP window elapsed from the last measurement.	When NIBP is measured again, the data is displayed in normal brightness.

IBP

Trouble	Possible Cause/Criteria	Action
The acquired blood pressure value is different from the estimated value.	Air bubbles remain in the circuit.	Remove the air bubbles.
	An extra tube is connected in the circuit.	Remove the extra tube.
	The position of the blood pressure transducer is inappropriate.	Check the position of the blood pressure transducer.
	A blood pressure transducer with different sensitivities is used.	Check the blood pressure transducer.
	Other causes.	Perform zero balance adjustment again.
No invasive blood pressure value appears on the screen.	The measurement is out of range.	Check the measuring condition.
	The blood pressure transducer is damaged.	Replace the blood pressure transducer with a new one.
No waveform is output from the ECG/BP OUTPUT socket.	IBP is monitored only using the MULTI sockets on the JA-690PA/694PA data acquisition unit.	IBP signal from one of the MULTI sockets on the input unit or smart expansion unit is used for BP output. Connect IBP to the MULTI socket for BP output.

Temperature

Trouble	Possible Cause/Criteria	Action
The temperature value is not displayed on the screen.	The temperature probe or temperature connection cord is faulty.	Replace the temperature probe or temperature connection cord with a new one.
	Monitor malfunction.	Contact your Nihon Kohden representative.

BIS

When Using BIS Processor/BISx

Trouble	Possible Cause/Criteria	Action
Nothing appears on the BIS window.	BIS processor or BISx failure.	Replace the BIS processor or BISx with a spare if available and contact you Nihon Kohden representative.

When Using BIS Monitor

Trouble	Possible Cause/Criteria	Action
The measured value for the BIS monitor is not displayed.	The BIS monitor is not connected to the bedside monitor.	Connect the BIS monitor to the bedside monitor with the QF-902P interface. Refer to the QF-902P interface manual.
	The interface is connected to a wrong socket on the BIS monitor.	Connect the interface to the correct socket. Refer to the QF-902P interface manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the QF-902P interface manual.

Cardiac Output

Trouble	Possible Cause/Criteria	Action
Infarction occurs.	The balloon burst.	Remove the catheter from the patient, treat the infarction and insert the new catheter into the patient. Check that the balloon is not damaged before use.
No CO data on the screen.	The MULTI socket on the AY-660P input unit is used for CO monitoring.	CO cannot be monitored by the MULTI socket on the AY-660P input unit. Use the MULTI socket on the other unit.

GAS

When Using AG-920R Multigas Unit

Trouble	Possible Cause/Criteria	Action
The power lamp on the rear panel of the multigas unit does not light.	The power cord is not connected to the multigas unit properly.	Connect the power cord properly. Refer to the AG-920R multigas unit manual.
	The power cord is not connected to the AC outlet properly.	
The MEASURE lamp on the front panel of the multigas unit does not light.	The power cord is not connected properly.	Connect the power cord properly. Refer to the AG-920R multigas unit manual.
	The interface cable is not connected to the multigas unit and main unit of the bedside monitor properly.	Connect the interface properly. Refer to the QF-904P interface manual.
The "Warming up" message does not disappear.	The sampling tube or exhaust gas adapter is bent.	Correct the bent portion and turn on a power supply again.
	The water trap or sampling line is kinked or blocked.	Replace with a new one.
	The multigas unit is not connected properly.	Connect the sampling gas exhaust outlet of the multigas unit to the scavenging system of the anesthetic machine properly.
The measured value is too low.	The sampling gas is leaking from a sampling tube, airway adapter or water trap.	Check that the water trap or sampling line is connected properly. Replace with a new one if necessary.
	The measurement sensitivity has shifted.	Perform gas calibration.
The measured value is too high.	The measurement sensitivity has shifted.	Perform gas calibration.

When Using GF-110PA Multigas Unit or GF-120PA Multigas/Flow Unit

Trouble	Possible Cause/Criteria	Action
The measured value and waveform are not displayed on the screen.	The multi-link cable is not connected to the monitor and multigas/flow unit properly.	Connect the multi-link cable properly.
	The software of the monitor doesn’t correspond to the multigas/flow unit.	Contact your Nihon Kohden representative.
The “GAS WARMING UP” message does not disappear.	The sampling tube or exhaust gas tube is bent.	Correct the bent portion and turn on the power supply again.
	The water trap or sampling line is kinked or blocked.	Replace with a new one.
	The exhaust gas tube is directly connected to an aspirator.	Connect the sampling gas exhaust outlet of the multigas/flow unit to the scavenging system of the anesthetic machine properly.
	Multigas/flow unit failure.	Contact your Nihon Kohden representative.
Gas calibration cannot be done.	Ten minutes have not passed since the power was turned on.	Perform gas calibration when one hour has passed since the power was turned on.
	The calibration gas is not flowing.	Flow the calibration gas.
	Multigas/flow unit failure.	Contact your Nihon Kohden representative.
The measured density of gas is low.	The sampling gas is leaking from the sampling line or T-piece.	Check that the sampling line or T-piece is connected properly. Replace with a new one if necessary.
	When an unspecified sampling line is used, accurate measurement is not possible and the gas may adsorb into the inner wall of the tube.	Use a Nihon Kohden specified sampling line.
	The measurement sensitivity has shifted.	Perform gas calibaration.
The measured density of gas is high.	When an unspecified sampling line is used, accurate measurement is not possible and the gas may adsorb into the inner wall of the tube.	Use a Nihon Kohden specified sampling line.
	The measurement sensitivity has shifted.	Perform gas calibaration.
	Pressure in the gas cylinder is low (less than 0.17 mPa at 200 mL/min) when the sensitivity calibration is done.	Replace with new calibration gas and calibrate again.
Anesthetic gas name displayed on the bedside monitor is different from the actual gas.	Nearby device is generating a strong noise.	Connect the noise-causing device to a different power source than the multigas/flow unit and monitor. Put the multigas/flow unit and monitor and the device that generates strong noise far away from each other.
	An unspecified power cord is used.	Use a Nihon Kohden specified power cord.
	The sampling line does not meet specifications.	Replace with a specified sampling line.
	Multigas/flow unit failure.	Contact your Nihon Kohden representative.

When Using GF-210R Multigas Unit or GF-220R Multigas/Flow Unit

Trouble	Possible Cause/Criteria	Action
No measured data displayed on the screen.	<GAS MEASUREMENT> on the GAS window is OFF.	Set the <GAS MEASUREMENT> on the GAS window to ON.
	The water trap is not attached properly. The sampling line is not connected properly.	Attach the water trap properly. Make sure that the water trap is securely attached to the unit. Connect the sampling line properly.
	The flow tube is disconnected from the unit. (GF-220R only)	Connect the flow tube to the unit securely.
The "GAS WARMING UP" message does not disappear.	The unit is still warming up.	Wait for the warm up to complete. Warming up takes about 6 minutes.
	Unit failure.	Contact your Nihon Kohden representative.
"---" is displayed on the screen.	The unit is still warming up.	Wait for the warm up to complete. Normally measurement value is displayed on the screen during warming up, "---" may appear due to calibration during warming up.
	Zeroing.	Wait for the zeroing to complete. "---" is displayed for GAS on the screen during zeroing.
	There is an alarm for a faulty unit.	Look at the multigas unit and remove the cause of alarm.
The measured value of is low.	—	Check the measurement accuracy. For details on the measurement accuracy check, refer to the Service Manual.
	The sampling gas is leaking from the sampling line or T-piece.	Check that the sampling line or T-piece is connected properly. Replace with a new one if necessary.
	An unspecified sampling line is used.	Use a Nihon Kohden specified sampling line. When an unspecified sampling line is used, accurate measurement is not possible and the gas may be absorbed into the inner wall of the tube.
	Patient's ventilation conditions are bad.	Check the patient's ventilation conditions. $ETCO_2$ may be less than $PaCO_2$ depending on the patient's ventilation conditions.
	Faulty anesthetic machine.	Contact the representative for the anesthetic machine.
	The measurement sensitivity has shifted (faulty unit).	Contact your Nihon Kohden representative.
The measured value of gas is high.	—	Check the measurement accuracy. For details on the measurement accuracy check, refer to the Service Manual.
	An unspecified sampling line is used.	Use a Nihon Kohden specified sampling line. When an unspecified sampling line is used, accurate measurement is not possible and the gas may be absorbed into the inner wall of the tube.
	Faulty anesthetic machine.	Contact the representative for the anesthetic machine.
	The measurement sensitivity has shifted (faulty unit).	Perform gas calibration.

Trouble	Possible Cause/Criteria	Action
Anesthetic gas name displayed on the screen is different from the actual gas.	Nearby device is causing strong noise interference.	Connect the noise-causing device to a different power source than the unit and monitor. Put the unit and the monitor far away from the device that generates noise.
	Spray is used around the unit.	Ventilate the air in the room.
	An unspecified power cord is used.	Use a Nihon Kohden specified power cord.
	An unspecified sampling line is used.	Use a Nihon Kohden specified sampling line.
	Faulty unit.	Contact your Nihon Kohden representative.

When Using Dräger Medical Primus/Fabius® Anesthesia Workstation

Trouble	Possible Cause/Criteria	Action
The measured value for the anesthesia workstation is not displayed.	The anesthesia workstation is not connected to the monitor.	Connect the anesthesia workstation to the monitor with the IF-920P communication cable. Refer to the IF-920P communication cable manual.
	The communication cable is connected to a wrong socket on the anesthesia workstation.	Connect the interface to the correct socket. Refer to the IF-920P communication cable manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the IF-920P communication cable manual.

O_2

Trouble	Possible Cause/Criteria	Action
The measured value is abnormal.	The direction of the oxygen sensor changed considerably after calibration.	Face the oxygen sensor downwards and calibrate again.
	Peripheral equipment problem.	Check the state of the equipment connected to the patient.
The measured value appears "– – –".	The oxygen sensor is not calibrated.	Calibrate the oxygen sensor.
	The oxygen sensor is deteriorated.	Replace the oxygen sensor with a new one.
No O_2 data on the screen.	The MULTI socket on the AY-660P input unit is used for O_2 monitoring.	O_2 cannot be monitored by the MULTI socket on the AY-660P input unit. Use the MULTI socket on the other unit.

Ventilation

Trouble	Possible Cause/Criteria	Action
The measured value for the ventilator is not displayed.	The ventilator is not connected to the bedside monitor.	Connect the ventilator to the bedside monitor with the interface or communication cable. Refer to the QF series interface or IF series communication cable manual.
	The interface or communication cable is connected to a wrong socket on the ventilator.	Connect the interface or communication cable to the correct socket. Refer to the QF series interface or IF series communication cable manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the QF series interface or IF series communication cable manual.
	The value is out of display range.	Check the measured data on the ventilator screen.

TOF

Trouble	Possible Cause/Criteria	Action
The TOF measured value is not displayed.	The TOF-watch® SX is not connected to the bedside monitor.	Connect the TOF-watch® SX to the bedside monitor with the QF-909P interface. Refer to the QF-909P interface manual.

CCO

When Using Vigilance Monitor

Trouble	Possible Cause/Criteria	Action
The measured value for the CCO monitor is not displayed.	The CCO monitor is not connected to the bedside monitor.	Connect the CCO monitor to the bedside monitor with the QF-903P interface. Refer to the QF-903P interface manual.
	The interface is connected to a wrong socket on the CCO monitor.	Connect the interface to the correct socket. Refer to the QF-903P interface manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the QF-903P interface manual.

When Using PiCCO Monitor

Trouble	Possible Cause/Criteria	Action
The measured value for the PiCCO monitor is not displayed.	The PiCCO monitor is not connected to the bedside monitor.	Connect the PiCCO monitor to the bedside monitor with the QF-911P interface. Refer to the QF-911P interface manual.
	The interface is connected to a wrong socket on the PiCCO monitor.	Connect the interface to the correct socket. Refer to the QF-911P interface manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the QF-911P interface manual.

CCO/$S\bar{v}O_2$

Trouble	Possible Cause/Criteria	Action
The measured value for the SO_2/CCO monitor is not displayed.	The SO_2/CCO monitor is not connected to the bedside monitor.	Connect the SO_2/CCO monitor to the bedside monitor with the IF-922P communication cable. Refer to the IF-922P communication cable manual.
	The communication cable is connected to a wrong socket on the SO_2/CCO monitor.	Connect the interface to the correct socket. Refer to the IF-922P communication cable manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the IF-922P communication cable manual.

FLOW/Paw

When Using GF-110PA Multigas/Flow Unit

Trouble	Possible Cause/Criteria	Action
The measured value and waveform are not displayed on the screen.	<FLOW/Paw MEASUREMENT> on the FLOW/Paw window is OFF.	Set the <FLOW/Paw MEASUREMENT> on the FLOW/Paw window to ON.
	The flow tube is not connected to the multigas/flow unit properly.	Connect the flow tube properly.
The accuracy of the measured C (Compliance) and R (Airway Resistance) are low.	In the following cases, C and R can not be measured accurately. • Patient with spontaneous breathing • Auto PEEP is applied • Flow gas is leaking	—
The accuracy of the measured flow is low.	The flow gas is leaking from a flow adapter, flow tube or respiration circuit.	Check that the flow adapter, flow tube and respiration circuit are connected properly. Replace with a new one if necessary.
	The settings of temperature and humidity are not set on the monitor.	Set the temperature and humidity in the flow adapter.
	The settings of gas composition are not set on the monitor. When the anesthetic gas is not monitored at the same time, it is necessary to set the gas composition manually.	Set the gas composition in the flow adapter.

When Using GF-220R Multigas/Flow Unit

Trouble	Possible Cause/Criteria	Action
The measured value and waveform are not displayed on the screen.	The flow tube is not connected to the unit properly.	Connect the flow tube properly.
"---" is displayed on the screen.	Respiration is not detected.	The measurement value is displayed after the 3 breaths are detected.
The accuracy of the measured C (Compliance) and R (Airway Resistance) are low.	In the following cases, C and R cannot be measured accurately. • Patient with spontaneous breathing • Auto PEEP is applied • Flow gas is leaking	—

Trouble	Possible Cause/Criteria	Action
The accuracy of the measured airway volume is low.	—	Check the measurement accuracy. For details on the measurement accuracy check, contact your Nihon Kohden representative.
	The flow gas is leaking from a flow adapter, flow tube or respiration circuit.	Check that the flow adapter, flow tube and respiration circuit are connected properly and not leaking. Replace the flow adapter or flow tube with a new one if necessary.
	Water droplets are on the flow tube.	Replace the flow tube with the new one.
	The settings of temperature and humidity are not set on the monitor.	Set the temperature and humidity in the flow adapter.
	The gas composition are not set on the monitor. When the anesthetic gas is not monitored at the same time, it is necessary to set the gas composition manually.	Set the gas composition in the flow adapter.
	Faulty unit.	Contact your Nihon Kohden representative.

EEG

Trouble	Possible Cause/Criteria	Action
Noise or artifacts superimposed on the waveforms.	The electrode lead is damaged.	Check that the electrode leads are not damaged.
	The Z electrode is not attached to the patient.	Attach the Z electrode.
	The 1 and 2 electrodes (JE-906P) or EEG1 (+) and EEG1 (–) electrodes (JE-905P) are not used.	Use the 1 and 2 electrodes (JE-906P) or EEG1 (+) and EEG1 (–) electrodes (JE-905P).
	The bed is not grounded.	When the bed is metallic, ground it.
	The monitor is not grounded.	Ground the monitor. Make sure that the provided power cord is used.
	Several ME instruments are used on the patient.	Perform equipotential grounding.
	There is an AC outlet or table tap near the patient or bed.	Arrange the measurement environment so that there is no influence from an AC power line.
	A desk lamp or fluorescent light is turned on.	Turn the desk lamp or fluorescent light off.
	The patient is touching some metal part.	Patient must not touch any metal part.
	An electric blanket is used.	Turn the electric blanket off and use another warming method.
	There is a cell phone or radio near the patient.	Turn the cell phone or radio off.
The waveform is not stable.	The Z electrode is not attached to the patient.	Attach the Z electrode to the patient.
	The 1 and 2 electrodes (JE-906P) or EEG1 (+) and EEG1 (–) electrodes (JE-905P) are not used.	Use the 1 and 2 electrodes (JE-906P) or EEG1 (+) and EEG1 (–) electrodes (JE-905P).
	New and old electrodes or different types of electrodes are used together.	Do not use the new and old electrode or different types of electrodes together. This may cause high polarization voltage.
Sometimes the waveform becomes flat.	The electrodes are not attached to the patient correctly.	Check the electrode attachment. Clean the electrode attachment to reduce impedance.

tcPO$_2$/tcPCO$_2$

Trouble	Possible Cause/Criteria	Action
The measured value for the transcutaneous monitor is not displayed.	The transcutaneous monitor is not connected to the bedside monitor.	Connect the transcutaneous monitor to the bedside monitor with the IF-913P or IF-914P communication cable. Refer to the IF-913P or IF-914P communication cable manual.
	The communication cable is connected to a wrong socket on the transcutaneous monitor.	Connect the communication cable to the correct socket. Refer to the IF-913P or IF-914P communication cable manual.
	The communication settings do not match.	Set the correct communication setting. Refer to the IF-913P or IF-914P communication cable manual.

Transmitter

Trouble	Possible Cause/Criteria	Action
"SIGNAL LOSS" message appears on the receiving monitor.	The sending monitor power is off.	Turn on the power of the sending monitor. When operating on battery, change to the fully charged battery.
	Telemetry reception failure.	Contact your Nihon Kohden representative.

12 Lead ECG

Trouble	Possible Cause/Criteria	Action
12 lead analysis result is not correct.	There was body movement when the waveforms for analysis were taken in.	Have the patient relax and perform analysis again.
	Electrodes were detached.	Attach the electrodes properly and perform analysis again.
	Patient's gender is not entered for the patient information.	Enter the patient's gender. When the patient's gender is not specified, the analysis is performed with the patient as male.
	Patient's date of birth is not entered for the patient information.	Enter the patient's date of birth. When the patient's date of birth is not entered, the analysis is performed with the patient as 35 years old.

Maintenance

CAUTION

Before maintenance, cleaning or disinfection, turn the bedside monitor main unit power off and disconnect the power cord from the AC socket. Failure to follow this instruction may result in electrical shock and bedside monitor main unit malfunction.

CAUTION

If fluids are accidentally spilled into the monitor, take the monitor out of service and contact your Nihon Kohden representative. The monitor must be disassembled, cleaned, dried and tested for safety and function.

CAUTION

Never disassemble or repair the monitor. If there is any problem with the monitor, contact your Nihon Kohden representative.

CAUTION

Dispose of Nihon Kohden products according to your local laws and your facility's guidelines for waste disposal. Otherwise, it may affect the environment. If there is a possibility that the product may have been contaminated with infection, dispose of it as medical waste according to your local laws and your facility's guidelines for medical waste. Otherwise, it may cause infection.

NOTE:
- Refer to the manual for each option for cleaning and disinfecting together with this manual.
- Follow the cleaning and disinfecting procedure in this section.
- Follow the directions of the gas provider for disposal of used calibration gas.

MU-631R, MU-651R and MU-671R Main Unit

Cleaning and Disinfecting the Main Unit

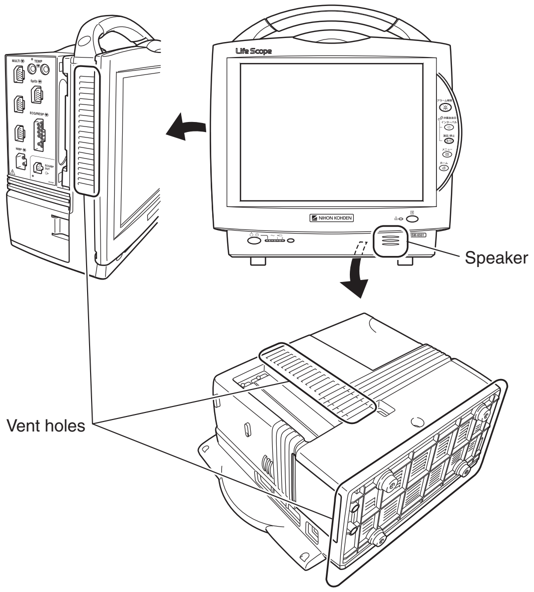
Before cleaning, turn off the main unit and disconnect the power cord.

After cleaning, let dry completely before connecting the power cord and turning on the main unit.

CAUTION

- Do not use volatile liquids such as thinner or benzine, because these will cause the materials to melt or crack.
- The main unit is not waterproof. Be careful not to let any water get inside the main unit.
- Never sterilize the main unit because the materials may deform, crack or discolor.

Cleaning



Clean the surface of the main unit every month with a soft cloth moistened with neutral soap, water or alcohol (76.9 to 81.4% by vol), and wipe with a dry cloth or gauze.

Remove dust from the speaker and vent holes on the panels with a cotton swab.

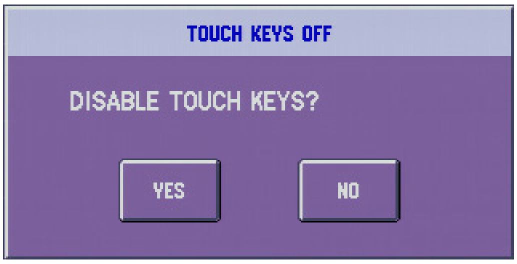
Disinfecting

To disinfect the outside surface of the main unit, wipe it with a non-abrasive cloth moistened with any of the disinfectants listed below. Use the recommended concentration.

Disinfectant	Concentration (%)
Chlorhexidine gluconate solution	0.5
Benzethonium chloride solution	0.2
Glutaraldehyde solution	2.0
Benzalkonium chloride	0.2
Alkyldiaminoethylglycine hydrochloride	0.5

Cleaning the Touch Screen

Before cleaning the touch screen, disable touch keys.



TOUCH KEYS OFF

DISABLE TOUCH KEYS?

1. Display the TOUCH KEYS OFF window.
   Press [Menu] key → TOUCH KEYS OFF key.

2. Touch the YES key to turn the touchkey function off. Touch the NO key to not turn the touchkey function off.

To turn the touchkey function on again, do any of the following.

- Press the [Silence Alarms] key
- Press the [NIBP Interval] key
- Press the [NIBP Start/Stop] key
- Press the [Menu] key
- Press the [Home] key
- Press the [Record] key

When the touchkey function is turned on by pressing a hard key, the function of that hard key is also performed. For example, if the ◇/▽ [NIBP Start/Stop] key is pressed, NIBP measurement in manual mode is performed.

Clean the touch screen using a dry soft cloth or a cloth which is moistened with neutral detergent and wrung out.

NOTE:
- Do not use a rough cloth.
- Do not use acidic, alkaline detergents or alcohol other than ethanol or isopropyl.

Disposing of the Main Unit

Remove the battery packs when disposing of the main unit. For detailed information about disposal, contact your Nihon Kohden representative.

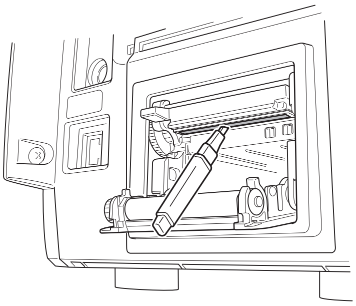
WS-671P Recorder Module

CAUTION

- Do not touch the recording head with any hard object. When the head is tapped with hard object, the head may crack and the heater element wire may break.
- Clean the head surface with the provided head cleaner pen before loading new paper. After a period of usage, paper dust may accumulate between the paper and the head surface and good printing cannot be obtained.
- Be careful not to cut yourself with the paper cutter on the recorder.

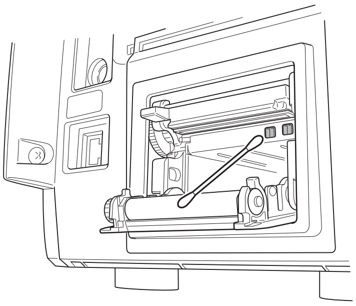
Cleaning the Thermal Head

To protect the thermal head from abrasion or damage and assure optimum performance and long service life, clean the surface of the head with the provided thermal head cleaning pen after every 10 to 15 sets of recording paper.



1. Push up the recorder door release lever and open the recorder door.
2. Clean the gold-colored part of the thermal head with the thermal head cleaning pen.

Cleaning the Sensors



The paper empty sensor and mark sensors are located as shown at the left. Clean the sensor surfaces with a cotton swab.

Disposing of the Recorder Module

For detailed information about disposal, contact your Nihon Kohden representative.

AY Series Input Unit and AA-672P/AA-674P Smart Expansion Unit

Cleaning and Disinfecting the Units

Clean and disinfect the units in the same way as cleaning and disinfecting the MU-631R/MU-651R/MU-671R main unit. Refer to the “MU-631R, MU-651R and MU-671R Main Unit” section.

Disposing of the Units

For detailed information about disposal, contact your Nihon Kohden representative.

SB-671P Battery Pack

Battery Lifetime

The battery pack can be used for approx. 200 cycles of full discharging/charging or one year whichever comes first.

Replacing the Batteries

Replace the batteries with a new one after 200 cycles of discharging/charging or after one year whichever comes first.

Disposing of Batteries

Before disposing of the batteries, check with your local solid waste officials for details in your area for recycling options or proper disposal. For detailed information about disposal, contact your Nihon Kohden representative.

RY-910P Remote Controller

Cleaning and Disinfecting the Remote Controller

Clean and disinfect the remote control in the same way as cleaning and disinfecting the MU-631R/MU-651R/MU-671R main unit. Refer to the “MU-631R, MU-651R and MU-671R Main Unit” section.

Disposing of the Remote Controller

Follow your local laws for disposing of the remote controller.

Replacing the Batteries

Replace the batteries when the batteries are discharged.

Disposing of Batteries

Before disposing of the batteries, check with your local solid waste officials for details in your area for recycling options or proper disposal.

QF series Interface and IF series Communication Cable

Cleaning and Disinfecting the Interface and Communication Cable

Clean and disinfect the interfaces and communication cables in the same way as cleaning and disinfecting the MU-631R/MU-651R/MU-671R main unit. Refer to the “MU-631R, MU-651R and MU-671R Main Unit” section.

Disposing of the Interface and Communication Cable

For detailed information about disposal, contact your Nihon Kohden representative.

Leads, Cables and Cords

NOTE:

- Do not touch the socket pin.
- Do not wet the socket.

Cleaning the Leads, Cables and Cords

Wipe with a soft cloth moistened with neutral soap, water or alcohol and wipe with a dry cloth or gauze.

Disinfecting the Leads, Cables and Cords

Wipe with a non-abrasive cloth moistened with any of the disinfectants listed below. Use the recommended concentration.

Disinfectant	Concentration (%)
Chlorhexidine gluconate solution	0.5
Benzethonium chloride solution	0.2
Glutaraldehyde solution	2.0
Benzalkonium chloride	0.2
Alkyldiaminoethylglycine hydrochloride	0.5

Disposing of Leads, Cables and Cords

For detailed information about disposal, contact your Nihon Kohden representative.

Electrodes, Probes, Cuffs, Thermistors, Transducers, Catheters and Other Consumables

See the instructions supplied with the item. Do not reuse disposable items. For detailed information about disposal, contact your Nihon Kohden representative.

Yearly Inspection

Check the following items every year to keep your monitor in optimal condition.

- Monitor is not dirty, damaged or rusty.
- No key or switch is broken.
- No damage to the sockets on the monitor.
- Power cord is not damaged.
- Grounding lead is properly connected.
- Screen is clean.
- Screen brightness can be adjusted.
- Screen display is correct.
- Clock is correct.
- SYSTEM SETUP settings are correct.
- The specified electrodes, sensors, transducers and probes are used.
- Recorder (option) operates properly when used.
- The specified recording paper is used.
- The printed date is correct.
- Alarm and sync sound can be heard clearly.
- Alarm setting is correct and functions properly.
- Alarm indicator lamps light.
- The sync sound is produced and sync mark is displayed.
- The blood pressure zero balance is performed.
- The blood pressure label is attached to the connection cord connector.

- The correct values are obtained for invasive blood pressure, CO_2 and O_2 in the calibration by the specified mercury manometer and calibration gas.
- No current leakage.
- Supplied voltage is correct.
- Measurement accuracy is within the specified range.
- Only the specified parts are used.

Safety Information for Maintenance on Optional Units

AG-920R, GF-110PA or GF-210R Multigas Unit and GF-120PA or GF-220R Multigas/Flow Unit

CAUTION

Before maintenance, cleaning or disinfection, turn the multigas unit power off and disconnect the power cord from the AC socket. Failure to follow this instruction may result in electrical shock and multigas unit malfunction.

CAUTION

Do not spray detergent or water in the vent hole of the multigas unit. The operator may receive electrical shock or the unit may be damaged.

CAUTION

Handle the contents of the water trap as you would handle any bodily fluid. Failure to follow this warning causes infection.

CAUTION

When the monitoring value is not appropriate, perform gas calibration. Perform gas calibration once a year for stable measuring accuracy.

CAUTION

Follow the CAUTION label on the CO_2 gas cylinder.

NOTE: Follow the directions of the gas provider for disposal of used calibration gas.

AG-400R CO_2 Unit

CAUTION

Before maintenance, cleaning or disinfection, turn the CO_2 unit power off and disconnect the power cord from the AC socket. Failure to follow this instruction may result in electrical shock and CO_2 unit malfunction.

CAUTION

Do not spray detergent or water in the vent hole of the CO_2 unit. The operator may receive electrical shock or the unit may be damaged.

CAUTION

When the monitoring value is not appropriate, perform gas calibration. Perform gas calibration every half year for stable measuring accuracy.

NOTE: Follow the directions of the gas provider for disposal of used calibration gas.

AE-918P Neuro Unit

CAUTION

Before maintenance, cleaning or disinfection, turn the instrument power off and disconnect the power cord from the AC socket. Failure to follow this instruction may result in electrical shock and instrument malfunction.

CAUTION

- Do not use volatile liquids such as thinner or benzine, because these will cause the materials to melt or crack.
- The neuro unit and EEG connection cord are not waterproof. Be careful not to let any water get inside the neuro unit and EEG connection cord.
- Never sterilize the neuro unit and EEG connection cord because the materials may deform, crack or discolor.

CAUTION

If fluids are accidentally spilled into the neuro unit, take the neuro unit out of service and contact your Nihon Kohden representative. The neuro unit must be disassembled, cleaned, dried and tested for safety and function.

Specifications

Measuring Parameters

ECG, respiration in impedance and thermistor method, SpO_2, NIBP, IBP, temperature, cardiac output, O_2, CO_2 in mainstream method and sidestream method, flow/Paw, BIS, anesthetic gas (CO_2, O_2, N_2O, agent), TOF, ventilation, CCO, EEG, $tcPO_2$, $tcPCO_2$

Influence on Measuring Accuracy by Electrosurgery/Defibrillation/Electrostatic Discharge

The bedside monitor returns to the previous operating mode within 10 seconds without loss of any stored data. When performing defibrillation, the filter setting on the bedside monitor must be set to MONITOR on the ECG window to return to the previous operating mode within 10 seconds without loss of any stored data. Measurement accuracy may be temporarily decreased while performing electro-surgery or defibrillation. This does not affect patient or equipment safety.

Display

Display size:	
BSM-6301:	10.4 inch, color TFT type LCD
BSM-6501:	12.1 inch, color TFT type LCD
BSM-6701:	15 inch, color TFT type LCD
Resolution:	
BSM-6301/6501:	800 × 600 dots
BSM-6701:	1024 × 768 dots
Viewing area:	
BSM-6301:	212.2 mm × 159.4 mm
BSM-6501:	246.0 mm × 184.5 mm
BSM-6701:	304.1 mm × 228.1 mm
Waveform display:	ECG (maximum 12 traces), respiration, IBP (maximum 7 traces), SpO_2 pulse wave, CO_2 and CO thermodilution curve, EEG, N_2O concentration, O_2 concentration, anesthetic agent concentration (Halothane, Isoflurane, Enflurane, Sevoflurane, Desflurane), flow, Paw, volume
Waveform display mode:	Non-fade moving or non-fade fixed
Maximum number of waveform trace:	15 traces
Sweep speed:	6.25, 12.5, 25 or 50 mm/s
Respiration sweep speed:	1.56, 6.25, 12.5 or 25 mm/s
Aspect ratio (ECG display sensitivity ratio to sweep speed):	
Standard:	0.4 s/mV
Setting range:	0.05 to 6.4 s/mV
Sweep time (at 25 mm/s sweep speed):	
BSM-6301:	6.0 s
BSM-6501:	6.5 s
BSM-6701:	9.5 s
Display delay time:	
DIAG and MONITOR mode:	≤ 250 ms
MAXIMUM mode:	≤ 1 s
Waveform display color:	12 colors
Numeric data display:	Heart rate, VPC rate, ST level, respiration rate, NIBP (systolic, diastolic, MAP), PWTT, delta PWTT, IBP (systolic, diastolic, mean), SpO_2, pulse rate, temperature, cardiac output, cardiac index, injectate temperature, blood temperature, O_2 concentration, $ETCO_2$, $FiCO_2$, BIS, inspired/expired N_2O concentration, inspired/expired O_2 concentration, inspired/expired anesthetic agent concentration

(Halothane, Isoflurane, Enflurane, Sevoflurane, Desflurane), minimum alveolar concentration, peak airway pressure, positive end expiratory pressure, mean airway pressure, minute volume, expiratory/inspiratory tidal volume, compliance, airway resistance, expiratory/inspiratory airway resistance, inspiration expiration ratio, inspired setO_2, CCO, SVRI, $S\bar{v}O_2$, Tb, EF, $Sc\bar{v}O_2$, CCI, EDV, SVR, EDVI, PCCO, PCCI, SEF, MDF, PPF, TP, Abs δ, Abs θ, Abs α, Abs β, Abs γ, % δ, % θ, % α, % β, % γ, $tcPO_2$, $tcPCO_2$, PPV, SPV

Synchronization mark: Heart rate sync mark, pulse rate sync mark, respiratory sync mark

Numeric display color: 12 colors

Recovery time after defibrillation: ≤ 10 s (at MONITOR mode)

Alarm

Alarm levels:

- Crisis: Patient is in critical condition and the patient's life may be at risk. Immediate action must be taken.
- Warning: Patient is in critical condition. Prompt action should be taken.
- Advisory: Setting or condition is not appropriate for accurate monitoring.

Alarm items:

- Vital sign alarms: HR, PR, ST, RR, APNEA, TEMP, delta TEMP, SpO_2, SpO_2-2, delta SpO_2, NIBP, IBP, $ETCO_2$, CO_2 (I), O_2 (I), O_2 (E), Tb, MV, Ppeak, PEEP, N_2O (I), N_2O (E), Agent (I), Agent (E), SEF, BIS
- Arrhythmia alarms: ASYSTOLE, VF, VT, V BRADY, EXT TACHY, EXT BRADY, SV TACHY, VPC RUN, TACHYCARDIA, BRADYCARDIA, COUPLET, EARLY VPC, MULTIFORM, V RHYTHM, PAUSE, BIGEMINY, TRIGEMINY, VPC, IRREGULAR RR, PACER NON-CAPTURE, PROLONGED RR, NO PACER PULSE
- Interbed alarms
- Technical alarms: Alarms concerning instrument and measuring environment such as, connector disconnection alarm, noise alarm, electrode off alarm, waveform detecting alarm, probe off alarm, cuff/hose check alarm, sensor check alarm, low battery alarm, etc.

Alarm indication*: Alarm sound, blinking/lighting alarm indicator, highlighted numeric data/message. Displays the alarmed item at the upper part of the screen.*
* Essential performance in EMC standard

Alarm indicator:

- Crisis: red blinking: approx. 1.6 Hz (approx. 640 ms), duty 50%
- Warning: yellow blinking: approx. 0.8 Hz (approx. 1280 ms), duty 50%
- Advisory: yellow or cyan lighting

Alarm sound:

- Crisis: NK1 (Continuous pip sound), NK2 (Continuous ping sound) or IEC standard
- Warning: NK1 (Continuous bing bong sound), NK2 (Continuous ding ding sound) or IEC standard
- Advisory: NK1 and NK2 (Single beep every 20 or 120 seconds) or IEC standard

Alarm silence: Provided for 1, 2 or 3 min. When another alarm occurs during alarm silence, alarm is indicated

Alarm suspend: Provided for 1, 2, 3 min or OFF

All alarms off: Provided

Alarm volume:

- Volume range: 45 to 85 dB (A) (Requirement of IEC 60601-2-49: 2001) (at 1 m in front of monitor)
- Volume priority: Crisis ≥ Warning ≥ Advisory

Alarm Delay Time

Includes time to output alarm from the network socket on the monitor when connected to the network.
Includes time to output alarm from the transmitter when the ZS-900P transmitter is connected.

Heart rate:	HR change from 80 to 120 bpm ≤ 10 seconds (upper limit: 100 bpm) HR change from 80 to 40 bpm ≤ 10 seconds (lower limit: 60 bpm)
Time to alarm for tachycardia:	Ventricular tachycardia (amplitude 1 mV p-v, heart rate 206 bpm): at ×1 gain (Test waveform name: aami4a*): 4 to 10 seconds at ×0.5 gain (Test waveform name: aami4a_h*): 4 to 10 seconds at ×2 gain (Test waveform name: aami4a_d*): 4 to 10 seconds Ventricular tachycardia (amplitude 2 mV p-v, heart rate 195 bpm): at ×1 gain (Test waveform name: aami4b*): 4 to 10 seconds at ×0.5 gain (Test waveform name: aami4b_h*): 4 to 10 seconds at ×2 gain (Test waveform name: aami4b_d*): 4 to 10 seconds * The test waveforms can be downloaded at http://www.physionet.org
Pulse rate:	PR change from 80 to 120 bpm ≤ 35 seconds (upper limit: 100 bpm) PR change from 80 to 40 bpm ≤ 35 seconds (lower limit: 60 bpm)
ST:	Approx. 1 second after measurement value reaches alarm threshold (averaged 15-second data)
Respiration rate:	Approx. 5 seconds after measurement value reaches alarm threshold (with 8 respiration intervals)
NIBP:	Approx. 1 seconds after measurement value becomes stable
IBP:	IBP change from 100 to 60 mmHg ≤ 15 seconds (at pulse rate 80 bpm, SYS lower limit: 80 mmHg)
SpO_2:	Approx. 5 seconds after measurement value reaches alarm threshold
Temperature:	Approx. 1 second after measurement value reaches alarm threshold
Blood temperature:	Approx. 1 second after measurement value reaches alarm threshold For catheter response time, refer to the manual for the catheter.
O_2 (when JO-900P FiO_2 connection cord is used):	Approx. 1 second after measurement value reaches alarm threshold Sensor response time (90%): Maximum 15 seconds
CO_2 (Mainstream and sidestream method):	Approx. 5 seconds after measurement value reaches alarm threshold (when the next respiration is detected)
Gas (CO_2, N_2O, O_2, anesthetic agent):	Approx. 5 seconds after measurement value reaches alarm threshold (when the next respiration is detected)
MV (FLOW):	Approx. 5 seconds after measurement value reaches alarm threshold (Integrated data from 8 respiration intervals and TV (tidal volume))
Ppeak, PEEP (FLOW):	Approx. 5 seconds after measurement value reaches alarm threshold (when the next respiration is detected)
BIS:	Approx. 1 second after measurement value reaches alarm threshold
SEF, TP (EEG):	Approx. 1 second after measurement value reaches alarm threshold

Alarm signal delay in central monitor network: ≤ 4 s

ECG

Complies with IEC 60601-2-27 1st edition: 1994, 2nd edition: 2005, ANSI/AAMI EC13: 2002, ANSI/AAMI EC57: 1998.

Leads:

3-electrode cable:	I, II, III
6-electrode cable:	I, II, III, aVR, aVL, aVF, 2 from V1 to V6
10-electrode cable:	I, II, III, aVR, aVL, aVF, V1 to V6
Defibrillation-proof:	ECG input protected against 400 Ws/DC 5 kV

	IEC 60601-2-27 17.101 compatible
Electrode offset potential tolerance:	≥ ±500 mV
Input dynamic range:	≥ ±5 mV
Internal noise:	≤ 30 µVp-p (Referred to input)
Noise suppression:	
RL driving gain:	maximum 40 dB
Maximum voltage:	1.23 Vrms
Common mode rejection ratio:	≥ 95 dB
Input bias current:	≤ 100 nA
Frequency response:	
DIAG mode:	0.05 to 150 Hz (–3 dB)
MONITOR mode:	0.3 to 40 Hz (–3 dB)
MAXIMUM mode:	1 to 18 Hz (–3 dB)
Input impedance:	≥ 5 MΩ (at 10 Hz) ≥ 2.5 MΩ (at 0.67 to 40 Hz)
ESU protection:	Provided, recovers within 10 seconds after ESU and acquired data is not lost. IEC 60601-2-27: 2005 compatible
Leads-off sensing:	Each leads has own sensing
Active electrode:	< 100 nA
Reference electrode:	< 900 nA
12 lead ECG interpretation:	ECAPS 12C (BSM) Available when monitoring 12 leads
Time constant (at 10 Hz):	3.2 s 0.05 to 150 Hz ±10 Hz (≥ –3 dB)
AC hum filter:	≤ –40 dB (at 50 or 60 Hz)
Interpretation items:	Normal sinus rhythm, TACHYCARDIA, BRADYCARDIA, VPC RUN, COUPLET, EARLY VPC
Display and output:	Screen, recorder module, network printer, printer connected to the central monitor
File storage:	6 files
Waveform display:	
Display sensitivity:	10 mm/mV ±5% (at ×1 sensitivity)
Number of channels:	3 (maximum, with 6 or 10 electrodes on home screen) 12 (maximum, with 10 electrodes at 12 LEAD window)
Sensitivity control:	×1/4, ×1/2, ×1, ×2, ×4, or AUTO
Pacing mark display:	Available
Recording sensitivity:	10 mm/mV ±5% (same as the display sensitivity)
Heart rate count:	
Calculation method:	Moving average/Instantaneous beat to beat
QRS detection (at × 1 sensitivity):	Adult: Width: 70 to 120 ms Amplitude: ≥ 0.5 mV, rate: 30 to 200 beats/min Child and neonate: Width: 40 to 120 ms Amplitude: ≥ 0.5 mV, rate: 30 to 250 beats/min
Counting range:	0, 15 to 300 beats/min (±2 beats/min)
Counting accuracy*:	±2 beats/min (0, 15 to 300 beats/min) * Essential performance in EMC standard
Heart rate display update cycle:	Every 3 s or when alarm is generated
Heart rate sync mark delay time:	within 100 to 200 ms (when QRS is detected)
Tall T-wave rejection capability:	Complies with the heights of T-waves from 0 mV to 1.2 mV specified in ANSI/AAMI EC13 Sect. 4.1.2.1(c)

Heart rate averaging: Calculated by using the most recent 4 or 12 beats.

Heart rate meter accuracy and response to irregular rhythm:

Ventricular bigeminy (Test waveform name: aami3a*): 80 bpm

Slow alternating ventricular bigeminy (Test waveform name: aami3b*): 60 bpm

Rapid alternating ventricular bigeminy (Test waveform name: aami3c*): 120 bpm

Bidirectional systoles (Test waveform name: aami3d*): 90 bpm

* The test waveforms can be download at http://www.physionet.org

Response time of heart rate meter to change in heart rate:

HR change from 80 to 120 bpm: 9 to 12 seconds

HR change from 80 to 40 bpm: 9 to 13 seconds

Time to alarm for tachycardia: Ventricular tachycardia (amplitude 1 mV p-v, heart rate 206 bpm):

at ×1 gain (Test waveform name: aami4a*): 4 to 10 seconds

at ×0.5 gain (Test waveform name: aami4a_h*): 4 to 10 seconds

at ×2 gain (Test waveform name: aami4a_d*): 4 to 10 seconds

Ventricular tachycardia (amplitude 2 mV p-v, heart rate 195 bpm):

at ×1 gain (Test waveform name: aami4b*): 4 to 10 seconds

at ×0.5 gain (Test waveform name: aami4b_h*): 4 to 10 seconds

at ×2 gain (Test waveform name: aami4b_d*): 4 to 10 seconds

* The test waveforms can be download at http://www.physionet.org

Pacemaker pulse detector rejection of fast ECG signals:

Slew rate at which the pacemaker pulse detector responds: 6 to 8 V/s

Tested as specified in ANSI/AAMI EC13 Sect. 4.1.4.3

Pacemaker pulse rejection capability, without overshoot:

Complies with the amplitudes of pacemaker pulses ±2 to ±700 mV and widths 0.1 to 2 ms specified in ANSI/AAMI EC13 Sect. 4.1.4.1

Pacemaker pulse rejection capability, with overshoot:

Overshoot amplitudes and time constants of ±0.12 mV/100 ms to ±2 mV/4 ms (As defined by method B of ANSI/AAMI EC13 Sect. 4.1.4.2, this corresponds to the pacemaker pulses amplitudes and widths of ±4 mV/2 ms to amplitudes ±80 mV/0.1 ms.)

Heart rate alarm: Upper limit range: 16 to 300 beats/min, OFF in 1 beat/min steps

Lower limit range: OFF, 15 to 299 beats/min in 1 beat/min steps

Alarm items: TACHYCARDIA, BRADYCARDIA

Arrhythmia analysis:

Analysis method: Multi-template matching method

Number of channels: 2

VPC counting rate: 0 to 99 VPCs/min

Arrhythmia message: ASYSTOLE, VF, VT, V BRADY, EXT TACHY, EXT BRADY, SV TACHY, VPC RUN, TACHYCARDIA, BRADYCARDIA, COUPLET, EARLY VPC, MULTIFORM, V RHYTHM, PAUSE, BIGEMINY, TRIGEMINY, VPC, IRREGULAR RR, PACER NON-CAPTURE, PROLONGED RR, NO PACER PULSE

Other messages: NOISE, CHECK ELECTRODES, LEARNING

Arrhythmia alarm: Upper limit range: OFF, 1 to 99 VPC/min

Number of arrhythmia recall files: 8,192 (24 hours)

Storage time per file: 8 s

ST level measurement:

Number of measurement channels: 3-electrode: 1 ch

6-electrode: 8 ch

10-electrode: 12 ch
ST level measuring range: ±2.5 mV
Measurement point: Manual
ST level alarm: Upper limit range: –1.99 to 2.00 mV in 0.01 mV steps, OFF
Lower limit range: OFF, –2.00 to 1.99 mV in 0.01 mV steps
Number of ST recall files: 1,440 files

Respiration (Transthoracic impedance pneumography)

Measuring method: Transthoracic impedance pneumography
Number of channels: Selectable from R-F and R-L
Measuring impedance available range: 220 Ω to 4 kΩ
Excitor current: 45 ±10 µArms at 40 kHz (sine wave)
Internal noise: ≤ 0.2 Ω (Referred to input)
Respiration rate counting range: 0 to 150 counts/min
Respiration rate counting accuracy*: ±2 counts/min (0 to 150 counts/min)
* Essential performance in EMC standard
Frequency response (high frequency cut-off):
3 Hz ±1 Hz (–3 dB)
Defibrillation proof: Respiration input protected against 400 Ws/DC 5 kV
Impedance respiration: Measurement On/Off available
Heart beat rejection: Available
Waveform display:
Display sensitivity: 10 mm/1 Ω ±25% (at ×1 sensitivity)
Sensitivity control: ×1/4, ×1/2, ×1, ×2, ×4
Respiration rate display update cycle: Every 3 s or when alarm is generated
Alarm: Upper limit range: 2 to 150 counts/min in 2 counts/min steps, OFF
Lower limit range: OFF, 0 to 148 counts/min in 2 counts/min steps
Apnea alarm: OFF, 5 to 40 s in 5 s steps
Displayed message: APNEA

SpO$_2$

Complies with ISO 9919: 2005.
Display:
Display update cycle: Every 3 s or when alarm is generated
Sync tone modulation: Changes tone depending on SpO$_2$ value
Sweep speed: 6.25, 12.5, 25, 50 mm/s
Waveform sensitivity: ×1/8, ×1/4, ×1/2, ×1, ×2, ×4, ×8 or AUTO
SpO$_2$:
Measuring method: Two wavelength light absorption method
Wavelength range: AY-631P/AY-633P: 660/905 nm (LNOP tip clip and LNCS tip clip)
663/880 nm (Other clips)
AY-651P/AY-653P: 660/900 nm
Emitted light energy: AY-631P/AY-633P: 0.13 mW minimum, 0.79 mW maximum
AY-651P/AY-653P: < 15 mW
Data delay time: ≤ 10 s
Averaging time: AY-651P/AY-653P: 6 to 7 s (approximately 3 seconds in FAST mode)
If the dynamic averaging time exceeds 20 seconds for SpO$_2$, the SpO$_2$ and pulse rate will continue to be updated every second.
Display range: AY-631P/AY-633P/AY-651P/AY-653P: 1 to 100%SpO$_2$
AY-660P/AY-661P/AY-663P/AY-671P/AY-673P: 0 to 100%SpO$_2$

Declared range:	AY-631P/AY-633P/AY-651P/AY-653P:	Depends on probe. Refer to the probe manual.
	AY-660P/AY-661P/AY-663P/AY-671P/AY-673P:	70 to 100%SpO_2
Measuring accuracy*:	AY-631P/AY-633P/AY-651P/AY-653P:	Depends on probe. Refer to the probe manual.
	AY-660P/AY-661P/AY-663P/AY-671P/AY-673P:	$70\%SpO_2 \leq \%SpO_2 \leq 80\%SpO_2$ ±3%SpO_2 $80\%SpO_2 \leq \%SpO_2 \leq 100\%SpO_2$ ±2%SpO_2 Accuracy at surrounding temperature: 18 to 40°C (64.4 to 104°F)

* Essential performance in EMC standard

NOTE for SpO_2 Accuracy of AY-660P/AY-661P/AY-663P/AY-671P/AY-673P:

- The SpO_2 accuracy was tested on OLV-3100 pulse oximeter using the TL-201T, TL-260T, TL-271T and TL-631T SpO_2 probes. The testing was performed during induced hypoxia on healthy volunteers (Ethnicity: 10 Caucasians, 2 Africans, 1 Asian and 3 Indians), (Skin: 8 Light, 4 Medium, 4 Dark), (Age: 21 to 34), (5 women and 11 men) under the condition of no motion. Arterial blood was sampled and measured by a CO-oximeter. The difference between SpO_2 measured by the SpO_2 probe and functional SaO_2 measured by a CO-oximeter was calculated using the root-mean-square (rms) according to ISO 9919: 2005. This measurement accuracy figure represents 2/3 of all test measurements.
- A pulse oximeter tester that generates simulated signals can be used to check the difference from the design specification, but it cannot be used as a replacement for human signals for testing accuracy.

NOTE for SpO_2 Accuracy of AY-631P/AY-633P/AY-651P/AY-653P:
The SpO_2 accuracy has been validated in human studies against arterial blood sample reference measured with a CO-oximeter. Pulse oximeter measurement are statistically distributed, only about two-thirds of the measurements can be expected to fall within the specified accuracy compared to CO-oximeter measurements.

NOTE for AY-631P/AY-633P
The plethysmographic waveform is scaled to a fixed size for signal strengths above 10% or 0.5%.

NOTE for AY-651P/AY-653P
Nellcor OEM modules communicate a non-normalized depiction of the plethysmographic waveform.

SpO_2 alarm:	Upper limit range:	51 to 100%SpO_2 in 1%SpO_2 steps , OFF
	Lower limit range:	OFF, 50 to 99%SpO_2 in 1%SpO_2 steps

Pulse rate:

Display range:	AY-631P/AY-633P:	25 to 240 beats/min
	AY-651P/AY-653P:	20 to 300 beats/min
	AY-660P/AY-661P/AY-663P/AY-671P/AY-673P:	30 to 300 beats/min

Declared range: AY-631P/AY-633P: 25 to 240 beats/min
AY-651P/AY-653P: 20 to 300 beats/min
AY-660P/AY-661P/AY-663P/AY-671P/AY-673P: 30 to 300 beats/min

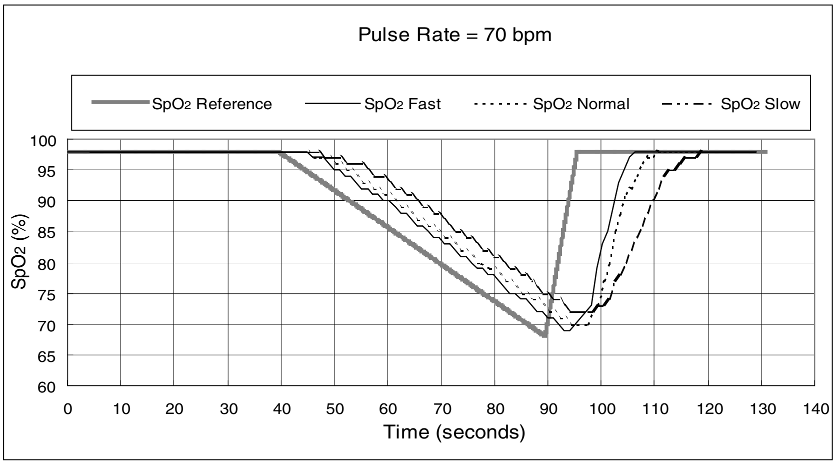
Counting accuracy (rms)*: AY-631P/AY-633P: ±3 beats/min: No motion
±5 beats/min: Motion
AY-651P/AY-653P: ±3 beats/min
AY-660P/AY-661P/AY-663P/AY-671P/AY-673P: ±3% ±1 beat/min
* Essential performance in EMC standard

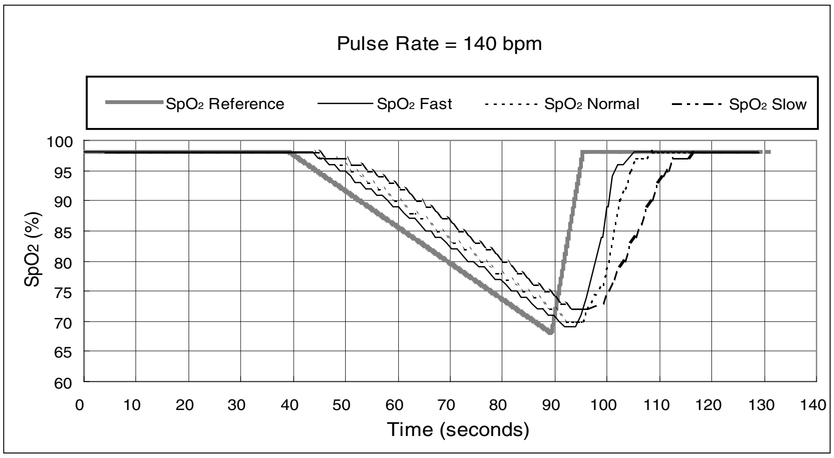
Pulse rate alarm: Upper limit range: When SYNC SOURCE is set to ECG:
16 to 300 beats/min in 1 beat/min steps, OFF
When SYNC SOURCE is set to PRESS or SpO_2:
31 to 300 beats/min in 1 beat/min steps, OFF
Lower limit range: When SYNC SOURCE is set to ECG:
OFF, 15 to 299 beats/min in 1 beat/min steps
When SYNC SOURCE is set to PRESS or SpO_2:
OFF, 30 to 299 beats/min in 1 beat/min steps

Response time (AY-660P/AY-661P/AY-663P only):

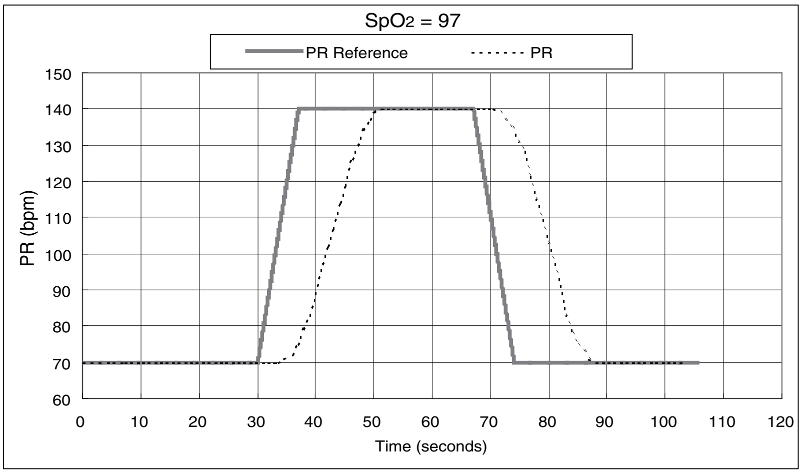
Selectable from “SLOW”, “NORMAL” and “FAST”.

The following graphs show the response time example when SpO_2 changes 0.6%/s.





The following graph shows the response time example when pulse rate changes 10 bpm/s.



Non Invasive Blood Pressure, NIBP

Complies with IEC 60601-2-30: 1999.

Measuring method: Oscillometric
Measuring range: 0 to 300 mmHg
Cuff pressure display range: 0 to 300 mmHg
Accuracy: ±3 mmHg (0 mmHg ≤ NIBP < 200 mmHg)
±4 mmHg (200 mmHg ≤ NIBP ≤ 300 mmHg)
Cuff inflation time:
Adult/Child: ≤ 7 s (700 cc)
Neonate: ≤ 5 s (72 cc)
Measurement mode: Adult, child or neonate is recognized by connected air hose
Maximum measurement time:
Adult/Child: ≤ 160 s
Neonate: ≤ 80 s
Operation mode: Manual, STAT (≤ 15 min), Periodic, PWTT and SIM (depends on the SITE setting)
Cuff pressure settings: Manual or Auto
Auto remeasurement: 1 time
Air leakage: ≤ 3 mmHg/min
Measurement accuracy with a simulator*: ±10 mmHg
* Essential performance in EMC standard
Initial pressurization value:
Adult: 180 mmHg
Child: 140 mmHg
Neonate: 100 mmHg
Maximum pressurization value:
Adult/Child: 300 mmHg
Neonate: 150 mmHg
Display items: Systolic (SYS), diastolic (DIA), mean (MAP), cuff pressure during NIBP measurement, delta PWTT
NIBP data display update cycle: Updated every measurement
Measurement completion sound: Generated at measurement completion (depends on the setting)
Alarm
Upper limit range: 15 to 260 mmHg in 5 mmHg steps, OFF
Lower limit range: OFF, 10 to 255 mmHg in 5 mmHg steps

Safety
    Maximum pressurization value cuff inflation limiter: Adult/Child: 300 to 330 mmHg
        Neonate: 150 to 165 mmHg
    Cuff inflation time limiter: Adult/Child: 161 to 165 s
        Neonate: 81 to 84 s
    Interval time limiter: 25 to 29 s
    Power discontinuity: Deflate immediately after power down

Multi Socket

Input impedance: ≥ 900 kΩ
Excitor output impedance: ≤ 2 Ω
Excitor overcurrent protection: 100 mA
+5 V maximum power output from the socket: 500 mA

Invasive Blood Pressure, IBP

Complies with IEC 60601-2-34: 2000 except for clauses 44.6, 45.101 a) and 45.101 b).
Complied transducer: P23XL-1 and P10EZ-1 Becton Dickinson disposable transducers
    Becton Dickinson disposable transducers DX series
    5 µV/V/mmHg, bridge resistor: 200 Ω to 20 kΩ, defibrillation-proof or the equivalents
Volume displacement: 0.04 mm^3/100 mmHg
Auto zero balancing range: ±200 mmHg
Auto zero balancing accuracy: ±1 mmHg
Measuring range: –50 to 300 mmHg
Measuring accuracy: ±1 mmHg ±1 digit (–50 mmHg ≤ IBP < 100 mmHg)
    ±1% ±1 digit (100 mmHg ≤ IBP ≤ 300 mmHg)
Total measuring accuracy*: ±4% or ±4 mmHg (whichever is greater)**
    * Essential performance in EMC standard
    ** When used with ANSI/AAMI BP-22-1994 complied equipments
Internal noise: within ±1 mmHg
Temperature zero drift: ±0.1 mmHg/1°C
Frequency response: DC to 12 Hz or 20 Hz (selectable)
Display items: Systolic (SYS), diastolic (DIA), mean (MEAN)
Display update cycle: Every 3 s or when alarm is generated
BP sync sound: Systolic value 20 to 120 mmHg, changes in 20 steps every 5 mmHg
Alarm:
    Upper limit range: 2 to 300 mmHg in 2 mmHg steps, OFF
    Lower limit range: OFF, 0 to 298 mmHg steps in 2 mmHg steps
    Alarm inactivation: Alarm is inactivated in certain period when zero balancing is performed.
Pulse rate
    Counting range: 0, 30 to 300 beats/min
    Display range: 0 to 300 beats/min
    Counting accuracy (rms): ±2 beats/min (30 beats/min ≤ PR ≤ 300 beats/min)
    Alarm: Upper limit range: When SYNC SOURCE is set to ECG:
            16 to 300 beats/min in 1 beat/min steps, OFF
            When SYNC SOURCE is set to PRESS or SpO_2:
            31 to 300 beats/min in 1 beat/min steps, OFF
        Lower limit range: When SYNC SOURCE is set to ECG:
            OFF, 15 to 299 beats/min in 1 beat/min steps

When SYNC SOURCE is set to PRESS or SpO_2:
OFF, 30 to 299 beats/min in 1 beat/min steps

Temperature

Complies with EN 12470-4: 2000 only for clauses 6.2, 6.3 a), 6.5, 6.6, 6.7, 6.8, 6.9, 6.10 and 8.

Number of channels: Up to 4 (2 channels fixed TEMP sockets and 1 MULTI socket)
Measuring range: 0 to 45°C, 32 to 113°F
Measuring accuracy*: ±0.1°C (25°C ≤ TEMP ≤ 45°C)
±0.2°C (0°C ≤ TEMP < 25°C)
* Essential performance in EMC standard
Internal noise: ≤ 0.014°C (at 37°C)
Temperature drift: within ±0.005°C /°C
Display range: 0 to 45°C (32 to 113°F)
Display update cycle: Every 3 s or when alarm is generated
Time response delay from probe to monitor display:
≤ 6 seconds (sensor time constant is not included)
Alarm
 Upper limit range: 0.1 to 45.0°C (33 to 113°F) in 0.1°C (1°F) steps, OFF
 Lower limit range: OFF, 0.0 to 44.9°C (32 to 112°F) in 0.1°C (1°F) steps

Carbon Dioxide, CO_2 (Mainstream method)

For the TG-900P/TG-920P/TG-950P/TG-970P* CO_2 sensor kit specifications, refer to the kit manual.
* TG-950P is not available for BSM-6000A series.

Calculation method
 TG-900P/TG-920P: semi-quantitative
 TG-950P/TG-970P: quantitative
CO_2 measuring range: 0 to 100 mmHg
CO_2 measuring accuracy**
 TG-900P/TG-920P: ±0.4 kPa ($0 \leq CO_2 \leq 1.33$ kPa) (±3 mmHg ($0 \leq CO_2 \leq 10$ mmHg))
±0.53 kPa ($1.33 < CO_2 \leq 5.33$ kPa) (±4 mmHg ($10 < CO_2 \leq 40$ mmHg))
±10% reading ($5.33 < CO_2 \leq 13.3$ kPa ($40 < CO_2 \leq 100$ mmHg))
(At 1 atmospheric pressure, air inspiration, no condensation)
 TG-950P/TG-970P: ±0.27 kPa ($0 \leq CO_2 \leq 5.33$ kPa) (±2 mmHg ($0 \leq CO_2 \leq 40$ mmHg))
±5% reading ($5.33 < CO_2 \leq 9.33$ kPa ($40 < CO_2 \leq 70$ mmHg))
±7% reading ($9.33 < CO_2 \leq 13.3$ kPa ($70 < CO_2 \leq 100$ mmHg))
(When no condensation)
** Essential performance in EMC standard
Warm-up time:
 TG-900P/TG-920P: 5 s
 TG-950P: 15 s
 TG-970P: 10 s
Response time
 TG-900P: 160 ms (typical) for steps from 10 to 90%
 TG-920P/TG-950P/TG-970P: 120 ms (typical) for steps from 10 to 90%
Respiration rate counting range
 TG-900P/TG-920P: 3 to 150 counts/min
 TG-950P/TG-970P: 0 to 150 counts/min
Respiration rate counting accuracy
 TG-900P/TG-920P: ±5% (3 to 60 counts/min)
±10% (61 to 150 counts/min)

TG-950P/TG-970P:	±1 count/min	
O_2 gas effect:		
TG-900P/TG-920P:	–10% rdg (at 100% O_2)	
TG-950P/TG-970P:	–8% rdg (at 100% O_2)	
N_2O anesthetic gas effect:	Accuracy in using N_2O anesthetic gas is not guaranteed	
CO_2 value display update cycle:	Every 3 s or when alarm is generated	
CO_2 alarm:		
Upper limit:	CO_2 (I):	1 to 5 mmHg in 1 mmHg steps, OFF 0.1 to 0.7 kPa in 0.1 kPa steps, OFF
	$ETCO_2$:	2 to 99 mmHg in 1 mmHg steps, OFF 1.0 to 13.5 kPa in 0.1 kPa steps, OFF
Lower limit:	$ETCO_2$:	OFF, 1 to 98 mmHg in 1 mmHg steps OFF, 0.5 to 13.0 kPa in 0.1 kPa steps
Respiration rate alarm:		
Upper limit range:	2 to 150 counts/min in 2 counts/min steps, OFF	
Lower limit range:	OFF, 0 to 148 counts/min in 2 counts/min steps	
Apnea time:	OFF, 5 to 40 s in 5 s steps Displayed message: APNEA	
Total system response time:	≤ 1.0 second	

Inspired Oxygen Fractional Concentration, O_2

Measuring parameters:	Inspired oxygen fraction concentration
Number of channels:	1
Calibration condition:	21 or 100% O_2
Measuring range:	10 to 100% O_2
Accuracy*:	±3% full scale (includes sensor, when calibrated with air) * Essential performance in EMC standard
Internal noise:	≤ 0.12% O_2RMS ±0.72% O_2
Temperature drift:	±0.12% O_2/°C
O_2 display update cycle:	Every 3 s or when alarm is generated
Alarm	
Upper limit range:	19 to 100% in 1% steps, OFF
Lower limit range:	18 to 99% in 1% steps

Cardiac Output, CO

Measuring method:	Thermodilution method
Measuring parameters:	Cardiac output (CO), injectate temperature (Ti), blood temperature (Tb), delta Tb
Number of channel:	1
Measuring range:	
Injectate temperature (Ti):	0°C to 27°C (32 to 81°F)
Blood temperature (Tb):	15°C to 45°C (59 to 113°F)
Thermodilution curve (delta Tb):	0°C to 2.5°C (32 to 37°F)
Cardiac output (CO):	0.5 to 20 L/min
Measuring accuracy:	
Ti:	±0.2°C (0°C to 27°C)
Tb:	±0.1°C (25°C ≤ TEMP ≤ 45°C) ±0.2°C (15°C ≤ TEMP < 25°C)
CO:	±5%
Internal noise:	
Ti:	≤ 0.025°C RMS

Tb: ≤ 0.016°C RMS (correspond to 37°C)
Delta Tb: ≤ 0.005°C RMS
Temperature drift:
Ti: ±0.005°C /°C
Tb: ±0.005°C /°C
Frequency response (delta Tb): DC to 12 Hz (–3 dB)
Injectate volume range: 3, 5, 10 mL
Display update cycle: Updated every measurement
Tb alarm
Upper limit range: 15.1 to 45.0°C (60 to 113°F) in 0.1°C (1°F) steps, OFF
Lower limit range: OFF, 15.0 to 44.9°C (59 to 112°F) in 0.1°C (1°F) steps

Respiration (Thermistor method)

Complied sensor: TR-900P respiration pickup for nose and TR-910P respiration pickup for airway
Measuring items: Thermistor respiration curve, respiration rate
Number of channel: 1
APNEA detection: Available
Respiration rate counting range: 0 to 150 counts/min
Respiration rate counting accuracy*: ±2 counts/min
* Essential performance in EMC standard
Measurable temperature range: 10 to 40°C
Internal noise: ≤ 2.5 Ω (Referred to input)
Frequency response: 0.1 to 3 Hz (–3 dB)
Waveform display:
Display sensitivity: 10 mm/100 Ω ±20% (at ×1 sensitivity)
Sensitivity control: ×1/4, ×1/2, ×1, ×2, ×4
Respiration rate display update cycle: Every 3 s or when alarm is generated
Alarm:
Upper limit range: 2 to 150 counts/min in 2 counts/min steps, OFF
Lower limit range: OFF, 0 to 148 counts/min in 2 counts/min steps
Apnea alarm: OFF, 5 to 40 s in 5 s steps
Displayed message: APNEA

Bispectral Index, BIS

For the BISx/BIS processor specifications, refer to the BISx/BIS processor manual.
BIS can be monitored with Aspect's BIS monitor.

BIS alarm:
Upper limit range: 2 to 100 in 1 steps, OFF
Lower limit range: OFF, 0 to 99% in 1 steps

ECG/BP Output

Outputs 100 mmHg/V IBP waveform and the first trace of 1 mV/V ECG waveform. When more than one IBP waveforms are acquired, the IBP waveform of the top MULTI socket on the AY-600P series input unit is output (when "FIXED POSITION" is set for IBP Analog Output) or the IBP waveform is output following the highest priority label (when "HIGHEST PRIORITY LABEL" is set for IBP Analog Output).

Complied medical electrical equipments
Connecting medical electrical equipment must comply to the following standards:
IEC 60601-1: 1988, Amendment 1: 1991, Amendment 2: 1995
CSA C22.2 No.601.1

Medical electrical equipment must be connected by specified method in following standards:
IEC 60601-1-1: 2000
CSA C22.2 No.60601-1-1-02

- Output impedance:
  - ECG: ≤ 100 Ω
  - BP: ≤ 100 Ω
- Output-waveform:
  - ECG: ±5.0 V (at 1 mV/V ± 5% sensitivity)
  - BP: –0.5 to +3.0 V (at 100 mmHg/V ± 1% sensitivity)
  - HT: 5.0 to 15.0 V (Open collector output: 0.5 to 100 mA)
- Frequency response:
  - ECG: ≥ 0.5 to 100 Hz (≥ –3 dB) (No reproducibility of pace maker pulse)
  - BP: ≥ DC to 20 Hz ±3 Hz (–3 dB)
- HT pulse width: 15 ms
- Gain:
  - ECG: 1000
- Offset:
  - ECG: ≤ ±50 mV
  - BP: ≤ ±10 mV
- Sensitivity accuracy:
  - ECG: ±5%
  - BP: ±1%
- Delay:
  - ECG, HT: 20 ms max
  - BP: 40 ms max

RGB Socket (when QI-631P or QI-671P is connected)

- Output signal: Analog RGB signal, 0.7 Vp-p
- Resolution:
  - BSM-6301/BSM-6501: 800 × 600 dots
  - BSM-6701: 1024 × 768 dots

RS-232C Socket (when QI-631P or QI-671P is connected)

- Serial communication: RS-232C complies
- Baud rate: 9600, 19200, 38400 bps

Alarm Socket (when QI-632P or QI-671P is connected)

- Nurse call output: Open collector output (Low active)

When WS-671P Recorder Module is Connected

- Recording method: Thermal array recording
- Number of channels: 3 traces (maximum)
- Recording width: ≥ 46 mm
- Paper speed: 12.5, 25, 50 mm/s
- Recording mode: Manual, periodic, alarm
- Recording density:
  - Amplitude direction: 8 dots/mm
  - Feeding direction: 40 dots/mm (≤ 25 mm/s)

20 dots/mm (50 mm/s)
Recording paper: FQW-50-2-100

When ZS-900P Transmitter is Connected

ZS-900P transmitter is not available for BSM-6000A series.
Frequency capacity deviation: ≤ ±3 ppm (15 to 35°C)
Transmission power: 1.0 mW +5%, –40% (15 to 35°C)
Spurious emission strength: ≤ 2.5 µW (5 MHz to 1.5 GHz)
Occupied bandwidth: 5.0 to 8.5 kHz
Adjacent channel leaking power: ≥ 40 dBR
Transmission frequency range: 420.0500 to 449.6625 MHz
Modulation method: Frequency shift keying

Gas

Gas can be monitored with the AG-920R, GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit. For the AG-920R, GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit specifications, refer to the manual.

Measurement method: Sidestream gas sampling
Measured parameters: Inspired/expired CO_2 partial pressure, inspired/expired N_2O concentration, inspired expired O_2 concentration, inspired/expired anesthetic agent concentration (Halothane, Isoflurane, Enflurane, Sevoflurane, Desflurane), respiration rate, minimum alveolar concentration
Warm-up time:
  AG-920R, GF-110PA/120PA: within 45 seconds to first measurement
  within 10 minutes to measurement with guaranteed accuracy
  GF-210R/220R: about 1 minute to CO_2 measurement
  about 6 minutes to measurement with guaranteed accuracy
Sampling rate: 70 to 100 mL/min ±10 mL/min
100 to 200 mL/min ±10%rel
Total system response time:
  AG-920R, GF-110PA/120PA: ≤ 5.0 seconds (when sampling volume is 200 mL/min, using adult sampling tube and adult water trap)
  GF-210R/220R: ≤ 5.0 seconds (when YG-610P sampling line is connected)
CO_2 measurement:
  Measurement method: Non-dispersive infrared ray absorption
  Measuring range: AG-920R, GF-110PA/120PA: 0 to 76 mmHg, 0 to 10.13 kPa
  GF-210R/220R: 0 to 10 vol%
  Measuring accuracy: AG-920R, GF-110PA/120PA: ±2 mmHg ($0 \le CO_2 < 40$ mmHg), ±0.27 kPa ($0 \le CO_2 < 5.33$ kPa)
  ±3 mmHg ($40 \le CO_2 < 55$ mmHg), ±0.40 kPa ($5.33 \le CO_2 < 7.33$ kPa)
  ±4 mmHg ($55 \le CO_2 \le 76$ mmHg), ±0.53 kPa ($7.33 \le CO_2 \le 10.13$ kPa)

NOTE for AG-920R and GF-110PA/120PA:
CO_2 measurement accuracy is maintained up to a respiratory rate of 60 bpm with I:E ratio of 1:3, 1:2, 1:1 and 2:1.

GF-210R/220R: ± (0.43 vol% + 8%rel)

NOTE for GF-210R and GF-220R:

CO_2 measurement accuracy is maintained up to a respiratory rate of 60 bpm with I:E ratio of 1:2.

Response time (10 to 90%): AG-920R, GF-110PA/120PA: ≤ 250 ms (under the condition of sampling flow is 200 mL/min and sampling line for adult and water trap for adult is connected)

Alarm: Upper limit: CO_2(I): 1 to 5 mmHg in 1 mmHg steps, OFF
0.1 to 0.7 kPa in 0.1 kPa steps, OFF
$ETCO_2$: 2 to 99 mmHg in 1 mmHg steps, OFF
1.0 to 13.5 kPa in 0.5 kPa steps, Off
Lower limit: $ETCO_2$: OFF, 1 to 98 mmHg in 1 mmHg steps
OFF, 0.5 to 13.0 kPa in 0.5 kPa steps

N_2O measurement:

Measurement method: Non-dispersive infrared ray absorption
Measuring range: AG-920R, GF-110PA/120PA: 0 to 100%
GF-210R/220R: 0 to 100 vol%
Measuring accuracy: AG-920R, GF-110PA/120PA: ±3%

NOTE for AG-920R and GF-110PA/120PA:

N_2O measurement accuracy is maintained up to a respiratory rate of 30 bpm with I:E ratio of 1:3, up to a respiratory rate of 40 bpm with I:E ratio of 1:2 and up to a respiratory rate of 60 bpm with I:E ratio of 1:1 and 2:1.

GF-210R/220R: ±(2vol% + 8%rel)

NOTE: N_2O measurement accuracy is maintained up to a respiratory rate of 60 bpm with I:E ratio of 1:2.

Response time (10 to 90%): AG-920R, GF-110PA/120PA: ≤ 250 ms (under the condition of sampling flow is 200 mL/min and sampling line for adult and water trap for adult is connected)

Alarm (N_2O(I), N_2O(E)): Upper limit: 1 to 100% in 1% steps, OFF
Lower limit: OFF, 0 to 99% in 1% steps

O_2 measurement:

Measurement method: Paramagnetic
Measuring range: 0 to 100%
Measuring accuracy: AG-920R, GF-110PA/120PA: ±2% $(0 \leq O_2 < 55\%)$
±3% $(55 \leq O_2 \leq 100\%)$
GF-210R/220R: ±(2.5 vol% + 2.5%rel)

NOTE for GF-210R/220R:

O_2 measurement accuracy is maintained up to a respiratory rate of 60 bpm with I:E ratio of 1:2.

Response time (10 to 90%): AG-920R, GF-110PA/120PA: ≤ 500 ms (under the condition of sampling flow is 200 mL/min and sampling line for adult and water trap for adult is connected)

Alarm: Upper limit: O_2(I): 19 to 100% in 1% steps, OFF
O_2(E): 11 to 100% in 1% steps, OFF
Lower limit: O_2(I): 18 to 99% in 1% steps
O_2(E): OFF, 10 to 99% in 1% steps

Anesthetic agent measurement:

Measurement method: Non-dispersive infrared ray absorption
Measured items: HAL (Halothane), ISO (Isoflurane), ENF (Enflurane), SEV (Sevoflurane), DES (Desflurane)
Measuring range: AG-920R, GF-110PA/120PA: HAL, ISO, ENF 0 to 5%

SEV 0 to 8%
DES 0 to 18%
GF-210R/220R: HAL, ISO 0 to 8.5 vol%
ENF, SEV 0 to 10 vol%
DES 0 to 20% vol%

Measuring accuracy: AG-920R, GF-110PA/120PA: ±0.2% ($0 \leq GAS \leq 5\%$)
±0.4% ($5 < GAS \leq 10\%$)
±0.6% ($10 < GAS \leq 15\%$)
±1.0% ($15 < GAS \leq 18\%$)

NOTE for AG-920R, GF-110PA and GF-120PA:
Anesthetic agent accuracy is maintained up to a respiratory rate of 60 bpm with I:E ratio of 1:3, 1:2, 1:1 and 2:1.

GF-210R/220R: ± (0.2 vol% +15%rel)

NOTE for GF-210R/220R:
Anesthetic agent accuracy is maintained up to a respiratory rate of 60 bpm with I:E ratio of 1:2.

Response time (10 to 90%) : AG-920R, GF-110PA/120PA: ≤ 300 ms (HAL, ISO, SEV, DES)
≤ 500 ms (ENF)
(under the condition of sampling flow is 200 mL/min and sampling line for adult and water trap for adult is connected)

Alarm: Upper limit: Agent(I), Agent(E) (HAL, ISO, SEV, ENF):
0.1 to 7.0% in 0.1% steps, OFF
DES(I), DES(E): 0.1 to 20.0% in 0.1% steps, OFF
Lower limit: Agent(I), Agent(E) (HAL, ISO, SEV, ENF):
OFF, 0.0 to 6.9% in 0.1% steps, OFF
DES(I), DES(E): OFF, 0.0 to 19.9% in 0.1% steps

MAC:

Uncorrected MAC: When AG-920R multigas unit is connected
Uncorrected MAC = %Et(AA1)/x(AA) + %Et(AA2)/x(AA) + %Et(N_2O)/x(N_2O)
%Et(AA1): End tidal concentration of the first anesthetic agent
%Et(AA2): End tidal concentration of the second anesthetic agent
%Et(N_2O): End tidal concentration of N_2O
x(AA): Uses the following values with the MAC of the first anesthetic agent
HAL = 0.77%, ENF = 1.7%, ISO = 1.15%, SEV = 2.1%, DES = 7.3%
x(N_2O): Uses 105% with the MAC of N_2O
For the GF-110PA or GF-210R multigas unit and GF-120PA or GF-220R multigas/flow unit, refer to the manual.

Ambient pressure corrected MAC: For GF-110PA or GF-210R multigas unit and GF-120PA or GF-220R multigas/flow unit, refer to the manual.

Enhanced MAC correction: For GF-110PA or GF-210R multigas unit and GF-120PA or GF-220R multigas/flow unit, refer to the manual.

Respiration rate:

Measuring range: 0, 4 to 60 counts/min
Measuring accuracy: ±1 count/min
Alarm: Upper limit: 2 to 150 counts/min in 2 counts/min steps, OFF
Lower limit: OFF, 0 to 148 counts/min in 2 counts/min steps
Apnea alarm: OFF, 5 to 40 s in 5 s steps
Displayed message: APNEA

Carbon Dioxide, CO_2 (Sidestream method)

CO_2 in sidestream method can be monitored with the AG-400R CO_2 unit.

For the AG-400R CO_2 unit specifications, refer to the AG-400R CO_2 unit manual.

Sampling flow: 50 mL/min +15/−7.5 mL/min

Warm up time: 30 s average (from power on to the measurable state)

Measuring range: 0 to 99 mmHg

Total measuring accuracy: Whichever greater in following measuring accuracy

Measuring accuracy: 0 to 38 mmHg ±2 mmHg

39 to 99 mmHg $\pm [5 + 0.08 \times (\chi - 39)]$ % of reading

χ: CO_2 partial pressure of a standard gas with a known CO_2 partial pressure (mmHg)

$ETCO_2$ and CO_2(I) alarm:

Upper limit: CO_2(I) : 1 to 5 mmHg in 1 mmHg steps, OFF

0.1 to 0.7 kPa in 0.1 kPs steps, OFF

$ETCO_2$: 2 to 99 mmHg in 1 mmHg steps, OFF

1.0 to 13.5 kPa in 0.5 kPa steps, OFF

Lower limit: $ETCO_2$: OFF, 1 to 98 mmHg in 1 mmHg steps

OFF, 0.5 to 13.0 kPa in 0.5 kPa steps

Respiration rate measuring range: 0 to 150 counts/min

Respiration rate measuring accuracy: 101 to 150 counts/min: ±5%

71 to 100 counts/min: ±3%

41 to 70 counts/min: ±2 counts/min

0 to 40 counts/min: ±1 count/min

Respiration rate alarm:

Upper limit range: 2 to 150 counts/min in 2 counts/min steps, OFF

Lower limit range: OFF, 0 to 148 counts/min in 2 counts/min steps

Apnea alarm: OFF, 5 to 40 s in 5 s steps

Displayed message: APNEA

Total system response time: ≤ 3.5 seconds

FLOW/Paw

Flow/Paw can be monitored with the GF-120PA or GF-220R multigas/flow unit. For the GF-120PA or GF-220R multigas/flow unit specifications, refer to the GF-120PA or GF-220R multigas/flow unit manual.

FLOW measurement:

Measurement method: Differential pressure method (fixed orifice)

Measuring range: –3 to +3 L/s

Measuring accuracy: ±3% rel or ±0.005 L/s whichever is greater

Applicable when 10 minutes or more has elapsed

Paw measurement:

Ppeak, Pmean, PEEP: Measuring range: –20 to +100 cmH_2O, hPa

Measuring accuracy: ±1 cmH_2O, hPa

Applicable when 10 minutes or more has elapsed

Ppeak alarm: Upper limit range: 1 to 100 cmH_2O, hPa in 1 cmH_2O, hPa steps, OFF

Lower limit range: OFF, 0 to 99 cmH_2O, hPa in 1 cmH_2O, hPa steps

PEEP alarm: Upper limit range: 1 to 50 cmH_2O, hPa in 1 cmH_2O, hPa steps, OFF

Lower limit range: OFF, 0 to 49 cmH_2O, hPa in 1 cmH_2O, hPa steps

Volume measurement:

Measuring range: 0 to 3000 mL

Measuring accuracy: ±5% rel or ±10 mL whichever is greater

Applicable when 10 minutes or more has elapsed

TVe, TVi measurement:	
Measuring range:	0 to 3000 mL
Display range:	0 to 9999 mL
Measuring accuracy:	±5% rel or ±10 mL whichever is greater Applicable when 10 minutes or more has elapsed Not applicable when TVi and TVe is less than 100 mL
MV measurement:	
Display range:	0 to 99.9 L/min
Alarm:	Upper limit range: 0.1 to 30.0 L/min in 0.1 L/min steps, OFF Lower limit range: OFF, 0.0 to 29.9 L/min in 0.1 L/min steps
C measurement:	
Display range:	0.0 to 999.9 mL/cmH_2O
R, Ri, Re measurement:	
Display range:	0.0 to 999.9 cmH_2O/L/s
Respiration rate measurement:	
Counting range:	0, 4 to 60 counts/min
Counting accuracy:	±1 counts/min
Alarm:	Upper limit range: 2 to 150 counts/min in 2 counts/min steps, OFF Lower limit range: OFF, 0 to 148 counts/min in 2 counts/min steps
Apnea time:	OFF, 5 to 40 s in 5 s steps Displayed message: APNEA

EEG

EEG can be monitored with the AE-918P neuro unit. For the AE-918P neuro unit specifications, refer to the AE-918P neuro unit manual.

Number of channels:	8
Measuring range:	
SEF, MDF, PPF:	0.0 to 62.5 Hz
TP:	0.01 to 9.99 nW
ABS δ, ABS θ, ABS α, ABS β, ABS γ:	1 to 9999 pW
% δ, % θ, % α, % β, % γ:	0 to 100%
Data display update cycle:	Every 3 s or when alarm is generated
Electrode impedance check:	> 10 kΩ within ±20%
Sensitivity:	10 μV/1 mm within ±5%
Non distorted maximum input:	> ±2 mV
Polarization voltage:	> ±700 mV
Input impedance:	> 15 MΩ at 10 Hz
CMRR:	> 110 dB (in isolation mode)
Frequency characteristics:	
High range:	70 Hz at 70% amplitude (−3 dB) within ±20%
Low range:	2 s ±20% or 0.08 Hz at 70% amplitude (−3 dB) within ±20%
AC filter:	attenuation ratio > 26 dB
Noise:	within 3 μVp-p
SEF alarm:	
Upper limit range:	1.0 to 60.0 Hz in 0.5 Hz steps, OFF
Lower limit range:	OFF, 0.5 to 59.5 Hz in 0.5 Hz steps
TP alarm:	
Upper limit range:	0.02 to 9.99 nW in 0.01 nW steps, OFF
Lower limit range:	OFF, 0.01 to 9.98 nW in 0.01 nW steps

Battery (SB-671P Battery Pack)

Type of battery:	Nickel-metal hydride
Number of batteries:	2
Battery lifetime:	1 year or 200 cycles of full discharging/charging
Battery operation time:	
BSM-6301/6501:	90 minutes
BSM-6701:	60 minutes
	(new battery, fully charged and no options are used in normal temperature)
DC voltage:	9.6 V
Charging current:	360 mA ±50 mA (normal use)
Charging time:	
During monitoring:	10 hours
During non-monitoring:	6 hours (two battery at the same time)
Battery status indication:	Battery lamps on the front panel, screen message and alarm sound, alarm indicator
Operating environment:	
Charging temperature:	10 to 55°C (50 to 131°F)
Discharging temperature:	5 to 50°C (41 to 122°F)
Humidity:	30 to 85% RH (noncondensing)
Atmospheric pressure:	700 to 1060 hPa
Transport and storage environment:	When the battery pack is stored more than 6 months, charge and discharge or charge the battery once every 6 months.
Temperature:	–20 to +60°C (–4 to +140°F) (within 30 days)
	–20 to +45°C (–4 to +113°F) (within 90 days)
	–20 to +35°C (–4 to +95°F) (more than 90 days)
Humidity:	20 to 85% RH (noncondensing)
Atmospheric pressure:	700 to 1060 hPa

Power Requirement

Line voltage:	
AC:	AC 100 to 240 V ±10%
DC (SB-671P):	8.5 to 12.6 V
Line frequency:	50 or 60 Hz
Power consumption:	
BSM-6301:	AC 140 VA
BSM-6501:	AC 90 VA
BSM-6701:	AC 100 VA

Clock Accuracy

At operating temperature 25°C:	approx. ±2 min 40 s/month maximum
At storage temperature –20 to +60°C:	approx. ±6 min/month maximum

Environment

Operating environment:	
Temperature:	10 to 40°C (50 to 104°F)
Humidity:	30 to 85% RH (10 to 40°C, noncondensing)
Atmospheric pressure:	700 to 1060 hPa
Transport and storage environment:	
Temperature:	–20 to +65°C (–4 to +149°F)
	–15 to +55°C (Recording paper)
Humidity:	10 to 95% RH

Atmospheric pressure: 700 to 1060 hPa

Mechanical Strength

Mechanical strength: Indoor mobile type

Electromagnetic Compatibility

IEC 60601-1-2: 2001
IEC 60601-1-2 Amendment 1: 2004

Safety Standard

Safety standard:
CAN/CSA C22.2 No. 601-1 M90 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 601-1S1-94 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 601-1B-98 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 60601-1-1-02 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 601.2.27-98 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 60601-2-30-02 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 60601-2-34-02 (BSM-6501A, BSM-6701A)
CAN/CSA C22.2 No. 60601-2-49-04 (BSM-6501A, BSM-6701A)
EN 12470-4: 2000*[1]
IEC 60601-1: 1988
IEC 60601-1 Amendment 1: 1991
IEC 60601-1 Amendment 2: 1995
IEC 60601-1-1: 2000
IEC 60601-1-2: 2001
IEC 60601-1-2 Amendment 1: 2004
IEC 60601-1-6: 2006
IEC 60601-1-8: 2006*[2]*[3]
IEC 60601-2-27: 1994 - Particular requirements for the safety of electrocardiographic monitoring equipment
IEC 60601-2-27: 2005 - Particular requirements for the safety, including essential performance, of electrocardiographic monitoring equipment
IEC 60601-2-30: 1999 - Particular requirements for the safety of automatic cycling in in-direct blood pressure monitoring equipment
IEC 60601-2-34: 2000 - Particular requirements for the safety of direct blood pressure monitoring equipment*[4]
IEC 60601-2-49: 2001 - Particular requirements for the safety of multifunction patient monitoring equipment
ISO 21647: 2004
ISO 9919: 2005

*[1] This monitor complies with EN 12470-4: 2000 only for clauses 6.2, 6.3 a), 6.5, 6.6, 6.7, 6.8, 6.9, 6.10 and 8.

*[2] Only the “IEC standard” alarm sound complies with clause 6.3.3.2.

*[3] This monitor complies with IEC 60601-1-8: 2006 except for interbed alarm.

*[4] This monitor complies with IEC 60601-2-34: 2000 except for clauses 44.6, 45.101 a) and 45.101 b).

Type of protection against electrical shock:
CLASS I EQUIPMENT (AC Powered)
Internally Powered EQUIPMENT (BATTERY Powered)

Degree of protection against electrical shock:

Defibrillator-proof type CF applied part:

AY-631P, AY-633P, AY-651P, AY-653P, AY-661P, AY-663P, AY-671P and AY-673P:
ECG, respiration (impedance and thermistor method), IBP, temperature, SpO_2, SpO_2-2, CO_2, O_2, NIBP, BIS

AY-660P: ECG, respiration (impedance method), IBP, temperature, SpO_2, CO_2, NIBP

AA-672P, AA-674P, JA-694P: Respiration (thermistor method), IBP, temperature, SpO_2-2, CO_2, O_2, BIS

CF applied part:

AY-631P, AY-633P, AY-651P, AY-653P, AY-661P, AY-663P, AY-671P, AY-673P, AA-672P, AA-674P and JA-694P:
CO

Degree of protection against harmful ingress of water:
IPX0 (non-protected)

Degree of safety of application in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE:
Equipment not suitable for use in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE

Mode of operation: CONTINUOUS OPERATION

Dimensions and Weight (approximate)

MU-631R main unit	Dimensions: 316 W × 325 H × 188 D mm (excluding protruding parts) Weight: 5.3 kg
MU-651R main unit	Dimensions: 342 W × 353 H × 183 D mm (excluding protruding parts) Weight: 7.0 kg
MU-671R main unit	Dimensions: 415 W × 392 H × 191 D mm (excluding protruding parts) Weight: 9.0 kg
AY-631P/AY-633P/AY-651P/AY-653P/AY-660P/AY-661P/AY-663P/AY-671P/AY-673P input unit	Dimensions: 83 W × 176 H × 145 D mm (excluding protruding parts) Weight: 1.3 kg
AA-672P/AA-674P smart expansion unit	Dimensions: 38 W × 165 H × 145 D mm (excluding protruding parts) Weight: 0.5 kg
WS-671P recorder module	Dimensions: 77 W × 73 H × 120 D mm (excluding protruding parts) Weight: 0.35 kg
QI-631P interface	Dimensions: 28.5 W × 94 H × 106 D mm (excluding protruding parts) Weight: 0.1 kg
QI-632P/QI-634P interface	Dimensions: 27 W × 94 H × 106 D mm (excluding protruding parts) Weight: 0.1 kg
QI-671P interface	Dimensions: 29 W × 173 H × 112 D mm (excluding protruding parts) Weight: 0.16 kg
QI-672P interface	Dimensions: 26 W × 173 H × 107 D mm (excluding protruding parts) Weight: 0.15 kg
RY-910PA remote controller	Dimensions: 45 W × 35 H × 135 D mm Weight: 0.08 kg
Interface QF series	Dimensions: 65 W × 23 H × 44 D mm (excluding cables) Weight: 0.13 kg
Communication cable IF series	Dimensions: 65 W × 23 H × 44 D mm (excluding cables) Weight: 0.13 kg
JA-690PA/JA-694PA data acquisition unit	Dimensions: 145 mm W × 205 mm H × 190 mm D Weight: 1.8 kg (JA-690PA), 2.0 kg (JA-694PA)

Electromagnetic Emissions

The BSM-6000’s essential performances in EMC standard satisfy the following criteria.

This Model BSM-6000 is intended for use in the electromagnetic environment specified below.
The customer or the user of the BSM-6000 should assure that it is used in such an environment.

BSM-6301 and BSM-6501 (JA-690PA/JA-694PA data acquisition unit, QE-910P BIS processor and QI-320PA wireless LAN station are not connected)

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The BSM-6301 and BSM-6501 (JA-690PA/JA-694PA, QE-910P and QI-320PA are not connected) use RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B*[1]	The BSM-6301 and BSM-6501 (JA-690PA/JA-694PA, QE-910P and QI-320PA are not connected) are suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A*[2]	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

*[1] BSM-6301 and BSM-6501 (when ZS-900P is connected) are CLASS A equipment if the equipments comply with IEC 60601-1-2: 2001 36.201.1 5 in the countries which do not have national wireless rule.

*[2] BSM-6301 is not applicable.

BSM-6301, BSM-6501 (JA-690PA/JA-694PA data acquisition unit, QE-910P BIS processor and QI-320PA wireless LAN station are connected) and BSM-6701

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The BSM-6301, BSM-6501 (JA-690PA/JA-694PA, QE-910P or QI-320PA is connected) and BSM-6701 use RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The BSM-6301, BSM-6501 (JA-690PA/JA-694PA, QE-910P or QI-320PA is connected) and BSM-6701 are suitable for use in all establishments, excluding domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A*	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

* BSM-6301 is not applicable.

Electromagnetic Immunity

The BSM-6000's essential performances in EMC standard satisfy the following criteria.

This Model BSM-6000 is intended for use in the electromagnetic environment specified below.
The customer or the user of the BSM-6000 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tiles. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s	<5% U_T (>95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the BSM-6000 requires continued operation during power mains interruptions, it is recommended that the BSM-6000 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the AC mains voltage prior to application of the test level			

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the BSM-6000 including cables than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	$d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m 80 MHz to 2.5 GHz	$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey*[1], should be less than the compliance level in each frequency range*[2]. Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

*[1] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the BSM-6000 is used exceeds the applicable RF compliance level above, the BSM-6000 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the BSM-6000.

*[2] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances between Portable and Mobile RF Communications Equipment

The BSM-6000 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the BSM-6000 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the BSM-6000 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

System Composition for EMC Test

The BSM-6000 bedside monitor is tested to comply with IEC 60601-1-2: 2001 and Amendment 1: 2004 with the following composition. If any part which is not specified by Nihon Kohden is used, the EMC specifications might not comply.

Units	Cable length
MU-631R/MU-651R/MU-671R main unit	—
AY-633P/AY-660P/AY-673P input unit	—
QM-600P memory unit	—
AA-674P smart expansion unit	—
QI-631P/QI-632P/QI-634P/QI-671P/QI-672P interface	—
BJ-900P ECG patient cable	3.8 m
JL-900P SpO_2 connection cord	2.5 m
TL-201T finger probe	1.6 m
JL-650P SpO_2 connection cord	3.0 m
JL-630P SpO_2 connection cord	3.0 m
LNOP-DCI Masimo adult reusable sensor	—
YN-921P air hose for neonate	3.5 m
YP-821P disposable cuff for neonate	0.2 m
YN-901P air hose for adult/child	3.5 m
YP-963T cuff for adult	0.15 m
JP-900P IBP connection cord	3.5 m
DX-300 monitoring kit	—
JT-950P CO connection cord	2.0 m
TC-704MU Becton Dickinson catheter soft type	1.1 m
SP-5030 bath probe	1.5 m
JT-900P temperature connection cord	0.3 m
401J thermistor probe for adult	3.5 m
402J thermistor probe for child	3.5 m
TG-900P CO_2 sensor kit	3.0 m
TG-920P CO_2 sensor kit	3.5 m
TG-950P CO_2 sensor kit	4.0 m
JO-900P FiO_2 connection cord	3.0 m
074705 oxygen sensor	0.6 m
TR-900P respiration pickup for nose	3.0 m
YJ-671P BISx connection cord	0.3 m
QE-910P BIS processor	—
YJ-910P ECG/BP output cable	5.0 m
QF-901P interface (including a cable for Drager ventilator)	—
QF-902P interface (including a cable for A-2000 BIS monitor)	—
QF-903P interface (including a cable for Vigilance CCO monitor)	—
QF-904P interface (including a cable for AG-920R multigas unit)	—
QF-905P interface (including a cable for AG-400R CO_2 unit)	—
YS-080P3 RGB cable	10 m
YS-089P2 serial connection cable	10 m
Basic optical mouse	—

Units	Cable length
SB-671P battery pack	—
ZS-900P transmitter	—
YS-089P7 network connection cable	0.7 m
QW-100Y (HIT-100) hyper isolation transformer	—
RY-910PA remote controller	—
Power cord W	2.5 m
Power cord H	2.5 m
Power cord N	2.4 m
Power cord UL	2.5 m
Power cord GB	2.5 m
Grounding lead	—
QI-320PA wireless LAN station	—
QI-600P interface unit	—
JA-690PA/JA-694PA data acquisition unit	—
YS-096P2/YS-096P3 unit connection cable	2.5 m/5.0 m
YS-096P5 multi-link cable	0.27 m

NOTE

When the following units are used, IEC 60601-1-2: 1993 complies.

- Multigas unit AG-920R
- CO_2 unit AG-400R

Factory Default Settings

The factory default settings of the SYSTEM CONFIGURATION screen and SYSTEM SETUP window are listed in the "Factory Default Settings" in Section 4, Administrator's Guide. Other default settings are listed in this manual.

OK:	The setting remains in memory even when the power is turned off.
30 min:	When <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON, the setting remains in memory for at least 30 minutes after turning power off. After 30 minutes, the setting changes back to the default setting. When the <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to OFF, you can select whether saving or initializing the settings.
Master:	When <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to ON, the setting remains in memory when the power is turned off. After 30 minutes, the setting returns to the master settings. When <AUTO ADMIT> in the SYSTEM CONFIGURATION screen is set to OFF, you can select whether saving or initializing the master settings.
–:	The setting returns to the default setting when the power is turned off.

When initializing the settings, all the settings other than network settings change back to the default settings of ICU mode. If the site setting is changed, the settings are not initialized. Only the settings that are different for each site change back to the default settings; the settings that are common to all sites do not change.

Event Bar

Items		Setting Items	Default Setting	Backup
EVENT BAR	UPPER LEFT	ARRHYTHMIA, TECHNICAL, LIMIT, OPERATION, NONE	ARRHYTHMIA	OK
	LOWER LEFT		TECHNICAL	
	UPPER RIGHT		LIMIT	
	LOWER RIGHT		OPERATION	
EVENT BAR INTERVAL(s)		1, 2, 4, 8, 24	4	

TREND Window

Window	Page	Items		Setting Items	Default Setting	Backup
TREND	GRAPH 1 GRAPH 2 GRAPH 3	TRENDGRAPH DISPLAY FORMAT		MAX-MIN, MEAN	MEAN	OK
		APNEA TREND TIME(s)		5, 10, 15, 20, 25, 30, 35, 40	20	
		SCALE	HR, PR	0-300 bpm	OR, ICU: 0-100 bpm NICU: 0-200 bpm	
			VPC	0-100 count/min	0-20 count/min	
			RR	0-150 count/min	OR, ICU: 0-50 count/min NICU: 0-150 count/min	
			APNEA-T	0-180 s	0-120 s	
			APNEA-F	0-12 s	0-6 s	
			NIBP	0-300 mmHg	OR, ICU: 0-200 mmHg NICU: 0-100 mmHg	
				0-40.0 kPa	OR, ICU: 0-26.5 kPa NICU: 0-13.5 kPa	
			CO_2(E)	0-120 mmHg	0-40 mmHg	
				0.0-16.0 kPa	0.0-5.5 kPa	
			CO_2(I)	0-5 mmHg	0-5 mmHg	
				0.0-1.0 kPa	0.0-0.7 kPa	
			O_2(E)	0-100%	30-60%	
			O_2(I)	0-100%	30-60%	
			SpO_2, SpO_2-2*	0-100%SpO_2	80-100%SpO_2	
			Tb	0.0-45.0°C	34.0-40.0°C	
				0.0-115.0°F	95.0-105.0°F	
			ST-I to ST-V6	±20.0 mm	±5.0 mm	
				±2.00 mV	±0.5 mV	
			ART, ART2, RAD, DORS, AO, LVP, FEM, P1 to P7	0-300 mmHg	OR, ICU: 0-200 mmHg NICU: 0-100 mmHg	
				0.0-40.0 kPa	OR, ICU: 0.0-26.5 kPa NICU: 0.0-13.5 kPa	
			UA	0-300 mmHg	0-100 mmHg	
				0.0-40.0 kPa	0.0-13.5 kPa	
			PAP, CVP, RAP, UV, RVP, LAP, ICP, ICP2 to ICP4	0-300 mmHg	0-50 mmHg	
				0.0-40.0 kPa	0.0-6.5 kPa	
			PPV/SPV	0-50%	0-25%	
			Tskin, Tskin2, Tskin3, Trect, Tcore, Tnaso, Teso, Ttymp, Tblad, Taxil, T1 to T4	0.0-45.0°C	34.0-40.0°C	
				0.0-115.0°F	95.0-105.0°F	
			N_2O(E), N_2O(I)	0-100%	50-80%	
			HAL(E), HAL(I), ISO(E), ISO(I), ENF(E), ENF(I), DES(E), DES(I), SEV(E), SEV(I)	0.0-20.0%	0.0-8.0%	
			BIS	0-100	0-100	
			SQI	0-100%	0-100%	
			SR	0-100%	0-100%	
			EMG	0.0-80.0 dB	30.0-80.0 dB	
			PWTT	0-500 ms	100-400 ms	
			CCO	0.00-20.00 L/min	4.00-6.00 L/min	
			CCI	0.00-20.00 L/min$_2$	4.00-6.00 L/min$_2$	
			$S\bar{v}O_2$	0-100%	60-80%	
			$Sc\bar{v}O_2$	0-100%	60-80%	
			EDV	0-800 mL	50-250 mL	

Window	Page	Items		Setting Items	Default Setting	Backup
TREND	GRAPH 1 GRAPH 2 GRAPH 3	SCALE	DO$_2$**	0-1200 mL/min	200-800 mL/min	OK
			DO$_2$I**	0-1200 mL/min/m^2	200-800 mL/min/m^2	
			VO$_2$**	0-500 mL/min	100-200 mL/min	
			VO$_2$I**	0-500 mL/min	100-200 mL/min	
			SVRI	0-30000	500-3000	
			SVV	0.0-50.0	0.0-20.0	
			PCCO	0.00-20.00	4.00-6.00	
			PCCI	0.00-20.00	4.00-6.00	
			TOFrat	0-200%	0-100%	
			TOFcnt	0-4 times	0-4 times	
			PTC	0-15 times	0-15 times	
			MV**	0.0-30.0	0.0-12.0	
			TVe**	0-2000	0-1000	
			C**	0-200	0-100	
			R**	0-100	0-50	
			Re**	0-100	0-50	
			Ri**	0-100	0-50	
			Ppeak**	0-150	0-50	
			Pmean**	0-150	0-20	
			PEEP**	0-150	0-10	
			tcPO$_2$	0-800 mmHg	0-200 mmHg	
				0.0-100.0 kPa	0.0-26.5 kPa	
			tcPCO$_2$	0-120 mmHg	0-80 mmHg	
				0.0-16.0 kPa	0.0-10.5 kPa	
		SETTINGS		HR, PR, VPC, RR, APNEA-T, APNEA-F, NIBP, CO$_2$(E), CO$_2$(I), O$_2$(E), O$_2$(I), SpO$_2$, SpO$_2$-2*, Tb, ST-I to ST-V6, ART, ART2, RAD, DORS, AO, FEM, UA, UV, PAP, CVP, RAP, RVP, LAP, LVP, ICP, ICP2 to ICP4, P1 to P7, PPV, SPV, Tskin, Tskin2, Tskin3, Trect, Tcore, Tnaso, Teso, Ttymp, Tblad, Taxil, T1 to T4, N$_2$O(E), N$_2$O(I), HAL(E), HAL(I), ISO(E), ISO(I), ENF(E), ENF(I), DES(E), DES(I), SEV(E), SEV(I), BIS, SQI, SR, EMG, PWTT, CCO, CCI, S$\bar{v}$O$_2$, Sc$\bar{v}$O$_2$, EDV, SVRI, SVV, PCCO, PCCI, DO$_2$**, DO$_2$I**, VO$_2$**, VO$_2$I**, TOFrat, TOFcnt, PTC, MV**, TVe**, C**, R**, Re**, Ri**, Ppeak**, Pmean**, PEEP**, tcPO$_2$, tcPCO$_2$, NONE	GRAPH 1 LEFT1: HR LEFT2, 3: NONE RIGHT1: SpO$_2$ RIGHT2, 3: NONE GRAPH2 LEFT1: NIBP LEFT2, 3: NONE RIGHT1: ART RIGHT2, 3: NONE GRAPH3 LEFT1: T1 LEFT2, 3: NONE RIGHT1: T2 RIGHT2, 3: NONE	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.

** Not available for BSM-6000A series.

Window	Page	Items		Setting Items	Default Setting	Backup
TREND	TABLE 1 TABLE 2 TABLE 3	SETTINGS	PARAMETER SETUP	HR, PR, VPC, RR, CO_2(E), CO_2(I), O_2(E), O_2(I), SpO_2, SpO_2-2*, Tb, ST-I to ST-V6, ART-SYS, ART-DIA, ART-MEAN, ART2-SYS, ART2-DIA, ART2-MEAN, RAD-SYS, RAD-DIA, RAD-MEAN, DORS-SYS, DORS-DIA, DORS-MEAN, AO-SYS, AO-DIA, AO-MEAN, FEM-SYS, FEM-DIA, FEM-MEAN, UA-SYS, UA-DIA, UA-MEAN, UV-MAX, UV-MIN, UV-MEAN, PAP-SYS, PAP-DIA, PAP-MEAN, CVP-MAX, CVP-MIN, CVP-MEAN, RAP-MAX, RAP-MIN, RAP-MEAN, RVP-SYS, RVP-DIA, RVP-MEAN, LAP-MAX, LAP-MIN, LAP-MEAN, LVP-SYS, LVP-DIA, LVP-MEAN, ICP-MAX, ICP2-MAX to ICP4-MAX, ICP-MIN, ICP2-MIN to ICP4-MIN, ICP-MEAN, ICP2-MEAN to ICP4-MEAN, P1-SYS to P7-SYS, P1-DIA to P7-DIA, P1-MEAN to P7-MEAN, PPV, SPV, Tskin, Tskin2, Tskin3, Trect, Tcore, Tnaso, Teso, Ttymp, Tblad, Taxil, T1 to T4, N_2O(E), N_2O(I), HAL(E), HAL(I), ISO(E), ISO(I), ENF(E), ENF(I), DES(E), DES(I), SEV(E), SEV(I), BIS, SQI, SR, EMG, CCO, CCI, $S\bar{v}O_2$, $Sc\bar{v}O_2$, EDV, EDVI, ESV, ESVI, EF, TOFrat, TOFcnt, PTC, PCCO, PCCI, SVR, SVRI, SVV, DO_2**, DO_2I**, VO_2**, VO_2I**, MV**, TVe**, C**, R**, Re**, Ri**, Ppeak**, Pmean**, PEEP**, $tcPO_2$, $tcPCO_2$, NONE	TABLE 1 1. HR, 2. PR, 3. RR, 4. SpO_2, 5. ART-SYS, 6. ART-DIA, 7. ART-MEAN, 8. CVP-MEAN, 9. T1, 10. T2, 11. CO_2(E), 12. O_2(I), 13. SEV(E), 14. SEV(I), 15. NONE TABLE2 1. HR, 2. PR, 3. VPC, 4. ST-II, 5. RR, 6. SpO_2, 7. ART-SYS, 8. ART-DIA, 9. ART-MEAN, 10. CVP-MEAN, 11. T1, 12. T2, 13. to 15. NONE TABLE3 1. HR, 2. PR, 3. RR, 4. SpO_2, 5. O_2(I), 6. T1, 7. to 15. NONE	OK
		INTERVAL		1 min, 5 min, 10 min, 15 min, 30 min, 1h	1 min	
	NIBP TREND	SETTINGS	PARAMETER SETUP	HR, PR, VPC, RR, CO_2(E), CO_2(I), O_2(E), O_2(I), SpO_2, SpO_2-2*, Tb, ST-I to ST-V6, ART-SYS, ART-DIA, ART-MEAN, ART2-SYS, ART2-DIA, ART2-MEAN, RAD-SYS, RAD-DIA, RAD-MEAN, DORS-SYS, DORS-DIA, DORS-MEAN, AO-SYS, AO-DIA, AO-MEAN, FEM-SYS, FEM-DIA, FEM-MEAN, UA-SYS, UA-DIA, UA-MEAN, UV-MAX, UV-MIN, UV-MEAN, PAP-SYS, PAP-DIA, PAP-MEAN, CVP-MAX, CVP-MIN, CVP-MEAN, RAP-MAX, RAP-MIN, RAP-MEAN, RVP-SYS, RVP-DIA, RVP-MEAN, LAP-MAX, LAP-MIN, LAP-MEAN, LVP-SYS, LVP-DIA, LVP-MEAN, ICP-MAX, ICP2-MAX to ICP7-MAX, ICP-MIN, ICP2-MIN to ICP4-MIN, ICP-MEAN, ICP2-MEAN to ICP4-MEAN, P1-SYS to P7-SYS, P1-DIA to P7-DIA, P1-MEAN to P7-MEAN, PPV, SPV, Tskin, Tskin2, Tskin3, Trect, Tcore, Tnaso, Teso, Ttymp, Tblad, Taxil, T1 to T4, N_2O(E), N_2O(I), HAL(E), HAL(I), ISO(E), ISO(I), ENF(E), ENF(I), DES(E), DES(I), SEV(E), SEV(I), BIS, SQI, SR, EMG, CCO, CCI, $S\bar{v}O_2$, $Sc\bar{v}O_2$, EDV, EDVI, ESV, ESVI, EF, TOFrat, TOFcnt, PTC, PCCO, PCCI, SVR, SVRI, SVV, DO_2**, DO_2I**, VO_2**, VO_2I**, MV**, TVe**, C**, R**, Re**, Ri**, Ppeak**, Pmean**, PEEP**, $tcPO_2$, $tcPCO_2$, NONE	1. NIBP-SYS, 2. NIBP-DIA, 3. NIBP-MAP, 4. NIBP-PR, 5. HR, 6. PR, 7. VPC, 8. ST-II, 9. RR, 10. SpO_2, 11. ART-SYS, 12. ART-DIA, 13. ART-MEAN, 14. CVP-MEAN, 15. T1	
	HEMO	SETTINGS		HR, CO, CI, CCO, CCI, ART-MEAN, PAP-MEAN, PCWP, PCWP, PCWP TIME, CVP, SV, SVI, LVSW, PPV	HR, CO, CI, CCO, CCI, ART-MEAN, PAP-MEAN, PCWP, PCWP, PCWP TIME, CVP, SV, SVI, LVSW	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.

** Not available for BSM-6000A series.

RECALL Window

Window	Page	Items		Setting Items	Default Setting	Backup
RECALL	ARRHYTH HISTORY	ARRHYTHMIA EVENT SETUP	ARRHYTHMIA ITEMS	ASYSTOLE, VF, VT, *V BRADY, *EXT TACHY, *EXT BRADY, *SV TACHY, VPC RUN, TACHYCARDIA, BRADYCARDIA, COUPLET, EARLY VPC, *MULTIFORM, *V RHYTHM, *PAUSE, BIGEMINY, *TRIGEMINY, VPC, *IRREGULAR RR, *PACER NON-CAPTURE, *PROLONGED RR, *NO PACER PULSE, ALL	ALL	OK

* Available only when “EXTENDED” is selected for arrhythmia type on the SYSTEM SETUP window. The arrhythmia type setting is not available on the BSM-6000A series bedside monitors. For BSM-6000A series, arrhythmia type is STANDARD only.

FULL DISC Window

Window	Page		Items	Setting Items	Default Setting	Backup
FULL DISC	SETTINGS	DISPLAY/ SAVE	DISPLAYED WAVES	–	1. TRACE1 2. NONE 3. NONE 4. NONE	OK
			SAVED WAVES	Select from <SELECT THE WAVE TO SAVE AND DISPLAY>	TRACE1, I, SpO_2, RESP(IMP), NONE	
		WAVE-FORMS	SELECT THE WAVE TO SAVE AND DISPLAY	TRACE1, TRACE2, I, II, III, aVR, aVL, aVF, V1 to V6, SpO_2, SpO_2-2*, RESP(IMP), RESP(THM), CO_2, CO_2(GAS), CO_2(EXT), ART, ART2, RAD, DORS, AO, FEM, UA, UV, PAP, CVP, RAP, RVP, LAP, LVP, ICP, ICP2 to ICP4, P1 to P7, EEG1(BIS), EEG2(BIS), FLOW**, Paw**, VOL**, EEG1 to EEG8**	TRACE1, I, SpO_2, RESP(IMP)	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.

** Not available for BSM-6000A series.

ST Window

Window	Page		Items	Setting Items	Default Setting	Backup
ST	ST INTERVAL	SETTINGS	ST POINT	ON, OFF	ON	OK
			ST WAVE ON HOME SCREEN	ON, OFF	OFF	
			ST REF WAVE ON HOME SCREEN	ON, OFF	OFF	
			LEAD	TRACE1 to TRACE3, I, II, III, aVR, aVL, aVF, V1 to V6	TRACE1 TRACE2 TRACE3	

OCRG Window

Window	Page	Items	Setting Items	Default Setting	Backup
OCRG	SETTINGS		1 cm/min, 3 cm/min	1 cm/min	OK
	SCALE	HR	210-60, 160-80, 220-100	210-60	
		SpO_2	100-60, 100-80	100-60	
		RESP (IMP)	×1/4, ×1/2, ×1, ×2, ×4	×1	

ADMIT Window

Window	Page	Items		Setting Items	Default Setting	Backup
ADMIT	ADMIT	PATIENT ID		Up to 16 characters	–	OK
		NAME		Up to 15 characters		
		DATE OF BIRTH		254 YEARS 11 MONTHS 30 DAYS before to the present date		
		AGE (calculated automatically)		0 YEAR 0 MONTH 0 DAY to AGE 254 YEARS 11 MONTHS 30 DAYS		
		HEIGHT/ WEIGHT	HEIGHT	0.1 to 299.9 cm		
				0 ft 0.1 in to 9 ft 11.9 in		
			WEIGHT	0.1 to 449.9 kg		
				0.1 to 654.9 lb		
		BSA (calculated automatically)		Related to input height and weight data		
		GENDER		MALE, FEMALE, –	– (blank)	
		PACEMAKER		YES, NO	OR, ICU: YES NICU: NO	

ALARM LIMITS Window

Vital Signs Alarms

Window	Page	Setting Items	Settings Range		Step	Default Setting	Backup
ALARM LIMITS	MAIN ALARMS	HR/PR	Upper	OFF, 16 to 300 beats/min	1	OR, ICU: 140 beats/min NICU: 200 beats/min	Master
			Lower	OFF, 15 to 299 beats/min		OR, ICU: 50 beats/min NICU: 100 beats/min	
		RR	Upper	OFF, 2 to 150 counts/min	2	OFF	
			Lower	OFF, 0 to 148 counts/min			
		APNEA	Upper	OFF, 5 to 40 s	5	20 s	
		CO$_2$ (E)	Upper	OFF, 2 to 99 mmHg	1	OFF	
				OFF, 1.0 to 13.5 kPa	0.5		
			Lower	OFF, 1 to 98 mmHg	1	OFF	
				OFF, 0.5 to 13.0 kPa	0.5		
		CO$_2$ (I)	Upper	OFF, 1 to 5 mmHg	1	3	
				OFF, 0.1 to 0.7 kPa	0.1	0.4	
		SpO$_2$, SpO$_2$-2**	Upper	OFF, 51 to 100%SpO$_2$	1	OR, ICU: OFF NICU: 95%SpO$_2$	
			Lower	OFF, 50 to 99%SpO$_2$		OR, ICU: 90%SpO$_2$ NICU: 85%SpO$_2$	
		ΔSpO$_2$**	Upper	OFF, 1 to 50%SpO$_2$	1	5%SpO$_2$	
		NIBP-SYS	Upper	OFF, 15 to 260 mmHg	5	OR, ICU: 180 mmHg NICU: 100 mmHg	
				OFF, 1.5 to 35.0 kPa	0.5	OR, ICU: 24.0 kPa NICU: 13.5 kPa	
			Lower	OFF, 10 to 255 mmHg	5	OR, ICU: 80 mmHg NICU: 50 mmHg	
				OFF, 1.0 to 34.5 kPa	0.5	OR, ICU: 10.5 kPa NICU: 6.5 kPa	
		NIBP-DIA	Upper	OFF, 15 to 260 mmHg	5	OFF	
				OFF, 1.5 to 35.0 kPa	0.5		
			Lower	OFF, 10 to 255 mmHg	5	OFF	
				OFF, 1.0 to 34.5 kPa	0.5		
		NIBP-MAP	Upper	OFF, 15 to 260 mmHg	5	OFF	
				OFF, 1.5 to 35.0 kPa	0.5		
			Lower	OFF, 10 to 255 mmHg	5	OFF	
				OFF, 1.0 to 34.5 kPa	0.5		
		BIS	Upper	OFF, 1 to 100	1	OFF	
			Lower	OFF, 0 to 99		40	
	ECG ALARMS	HR/PR	Upper	OFF, 16 to 300 beats/min	1	OR, ICU: 140 beats/min NICU: 200 beats/min	
			Lower	OFF, 15 to 299 beats/min		OR, ICU: 50 beats/min NICU: 100 beats/min	
		VPC*	Upper	OFF, 1 to 99 beats/min	1	OFF	
		ST-I to ST-V6	Upper	OFF, –1.99 to 2.00 mV	0.01	OFF	
				OFF, –19.9 to 20.0 mm	0.1		
			Lower	OFF, –2.00 to 1.99 mV	0.01	OFF	
				OFF, –20.0 to 19.9 mm	0.1		
	PRESS1 ALARMS	P1-SYS to P7-SYS	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		P1-DIA to P7-DIA	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		P1-MEAN to P7-MEAN	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		

* Available only when the ARRHYTHMIA ANALYSIS is set to ON.

** Available only when AY-661P, AY-663P, AY-671P or AY-673P input unit is used.

Window	Page	Setting Items	Settings Range		Step	Default Setting	Backup
ALARM LIMITS	PRESS2 ALARMS	ART-SYS, ART2-SYS, RAD-SYS, DORS-SYS, AO-SYS, FEM-SYS	Upper	OFF, 2 to 300 mmHg	2	OFF	Master
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmH	2	OR, ICU: 80 mmHg NICU: 50 mmHg	
				OFF, 0.0 to 39.5 kPa	0.5	OR, ICU: 10.5 kPa NICU: 6.5 kPa	
		ART-DIA, ART2-DIA, RAD-DIA, DORS-DIA, AO-DIA, FEM-DIA	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		ART-MEAN, ART2-MEAN, RAD-MEAN, DORS-MEAN, AO-MEAN, FEM-MEAN	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OR, ICU: 60 mmHg NICU: 30 mmHg	
				OFF, 0.0 to 39.5 kPa	0.5	OR, ICU: 8.0 kPa NICU: 4.0 kPa	
		UA-SYS	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		UA-DIA	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		UA-MEAN, UV-MEAN	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
	PRESS3 ALARMS	PAP-SYS, RVP-SYS, LVP-SYS	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		PAP-DIA, RVP-DIA, LVP-DIA	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
		PAP-MEAN, CVP-MEAN, RAP-MEAN, RVP-MEAN, LAP-MEAN, LVP-MEAN, ICP-MEAN, ICP2-MEAN to ICP4-MEAN	Upper	OFF, 2 to 300 mmHg	2	OFF	
				OFF, 0.5 to 40.0 kPa	0.5		
			Lower	OFF, 0 to 298 mmHg	2	OFF	
				OFF, 0.0 to 39.5 kPa	0.5		
	TEMP ALARMS	T1 to T4, Tskin, Tskin2, Tskin3, Trect, Tcore, Tnaso, Teso, Ttymp	Upper	OFF, 0.1 to 45.0°C	0.1	OR, ICU: 38.0°C NICU: 39.0°C	
				OFF, 33.0 to 113.0°F	1.0	OR, ICU: 100°F NICU: 102°F	
			Lower	OFF, 0.0 to 44.9°C	0.1	OFF	
				OFF, 32.0 to 112.0°F	1.0		
		Tblad, Taxil	Upper	OFF, 0.1 to 45.0°C	0.1	OR, ICU: 38.0°C NICU: 39.0°C	
				OFF, 33.0 to 113.0°F	1.0	OR, ICU: 100°F NICU: 102°F	
			Lower	OFF, 0.0 to 44.9°C	0.1	OFF	
				OFF, 32.0 to 112.0°F	1.0		
		Tb	Upper	OFF, 15.1 to 45.0°C	0.1	OR, ICU: 38.0°C NICU: 39.0°C	
				OFF, 51.0 to 113.0°F	1.0	OR, ICU: 100°F NICU: 102°F	
			Lower	OFF, 15.0 to 44.9°C	0.1	OFF	
				OFF, 50.0 to 112.0°F	1.0		

Window	Page	Setting Items	Settings Range		Step	Default Setting	Backup
ALARM LIMITS	TEMP ALARMS	ΔT, ΔT2	Upper	OFF, 0.1 to 45.0°C	0.1	OFF	Master
				OFF, 1.0 to 113.0°F	1.0		
	GAS ALARMS	RR	Upper	OFF, 2 to 150 counts/min	2	OFF	
			Lower	OFF, 0 to 148 counts/min		OFF	
		APNEA	Upper	OFF, 5 to 40 s	5	20 s	
		CO_2(E)	Upper	OFF, 2 to 99 mmHg	1	OFF	
				OFF, 1.0 to 13.5 kPa	0.5		
			Lower	OFF, 1 to 98 mmHg	1	OFF	
				OFF, 0.5 to 13.0 kPa	0.5		
		CO_2(I)	Upper	OFF, 1 to 5 mmHg	1	OR: 3 mmHg ICU, NICU: OFF	
				OFF, 0.1 to 0.7 kPa	0.1	OR: 0.4 kPa ICU, NICU: OFF	
		O_2(E)	Upper	OFF, 11 to 100%	1	OFF	
			Lower	OFF, 10 to 99%		OFF	
		O_2(I)	Upper	OFF, 19 to 100%	1	OFF	
			Lower	18 to 99%		18%	
		N_2O(E)	Upper	OFF, 1 to 100%	1	OFF	
			Lower	OFF, 0 to 99%		OFF	
		N_2O(I)	Upper	OFF, 1 to 100%	1	80%	
			Lower	OFF, 0 to 99%		OFF	
		HAL(E)	Upper	OFF, 0.1 to 7.0%	0.1	OFF	
			Lower	OFF, 0.0 to 6.9%		OFF	
		HAL(I)	Upper	OFF, 0.1 to 7.0%	0.1	4.0%	
			Lower	OFF, 0.0 to 6.9%		OFF	
		ISO(E)	Upper	OFF, 0.1 to 7.0%	0.1	OFF	
			Lower	OFF, 0.0 to 6.9%		OFF	
		ISO(I)	Upper	OFF, 0.1 to 7.0%	0.1	5.0%	
			Lower	OFF, 0.0 to 6.9%		OFF	
		ENF(E)	Upper	OFF, 0.1 to 7.0%	0.1	OFF	
			Lower	OFF, 0.0 to 6.9%		OFF	
		ENF(I)	Upper	OFF, 0.1 to 7.0%	0.1	5.0%	
			Lower	OFF, 0.0 to 6.9%		OFF	
		SEV(E)	Upper	OFF, 0.1 to 7.0%	0.1	OFF	
			Lower	OFF, 0.0 to 6.9%		OFF	
		SEV(I)	Upper	OFF, 0.1 to 7.0%	0.1	6.0%	
			Lower	OFF, 0.0 to 6.9%		OFF	
		DES(E)	Upper	OFF, 0.1 to 20.0%	0.1	OFF	
			Lower	OFF, 0.0 to 19.9%		OFF	
		DES(I)	Upper	OFF, 0.1 to 20.0%	0.1	12.0%	
			Lower	OFF, 0.0 to 19.9%		OFF	
	OTHER ALARMS	MV*	Upper	OFF, 0.1 to 30.0 L/min	0.1	OR, ICU: 10.0 NICU: OFF	
			Lower	OFF, 0.0 to 29.9 L/min		OR, ICU: 2.0 NICU: OFF	
		Ppeak*	Upper	OFF, 1 to 100 cmH_2O	1	OR, ICU: 40 NICU: OFF	
			Lower	OFF, 0 to 99 cmH_2O		OR, ICU: OFF NICU: OFF	
		PEEP*	Upper	OFF, 1 to 50 cmH_2O	1	OR, ICU: 10 NICU: OFF	
			Lower	OFF, 0 to 49 cmH_2O		OR, ICU: OFF NICU: OFF	
		SEF*	Upper	OFF, 1.0 to 60.0 Hz	0.5	OFF	
			Lower	OFF, 0.5 to 59.5 Hz		OFF	
		TP*	Upper	OFF, 0.02 to 9.99 nW	0.01	OFF	
			Lower	OFF, 0.01 to 9.98 nW		OFF	

* Not available for BSM-6000A series.

Arrhythmia Alarms

Window	Page	Setting Items	Settings Range	Step	Default Setting	Backup
ARRHYTH ALARMS	ARRHYTH	ASYSTOLE	ON fixed 3 to 10 s	1	OR, ICU: 5 s NICU: 3 s	Master
		VF	ON fixed	–	ON	
		VT	ON fixed	–	ON	
		EXT TACHY*	ON, OFF	–	OFF	
			Upper heart rate alarm limit to 300	1	OR, ICU: 160 bpm NICU: 220 bpm	
		EXT BRADY*	ON, OFF	–	OFF	
			15 to lower heart rate alarm limit	1	OR, ICU: 40 bpm NICU: 80 bpm	
		VPC RUN	ON, OFF	–	OR, NICU: OFF ICU: ON	
			16 to 300 bpm	1	OR, ICU: 100 bpm NICU: 140 bpm	
			3 to 8 beats	1	3 beats	
		V BRADY*	ON, OFF	–	OR, NICU: OFF ICU: ON	
			15 to 299 bpm	1	OR, ICU: 50 bpm NICU: 60 bpm	
		SV TACHY*	ON, OFF	–	OFF	
			16 to 300 bpm	1	OR, ICU: 170 bpm NICU: 210 bpm	
			3 to 9 beats	1	6 beats	
		PAUSE*	ON, OFF	–	ON	
			1.0 to 3.0 s	0.1	OR, ICU: 3.0 s NICU: 1.5 s	
		COUPLET	ON, OFF	–	OFF	
		EARLY VPC	ON, OFF	–	OFF	
		MULTIFORM*	ON, OFF	–	OFF	
		V RHYTHM*	ON, OFF	–	OR, NICU: OFF ICU: ON	
		BIGEMINY	ON, OFF	–	OFF	
		TRGEMINY*	ON, OFF	–	OFF	
		IRREGULAR RR*	ON, OFF	–	OFF	
		PROLONGED RR*	ON, OFF	–	OFF	
		NO PACER PULSE*	ON, OFF	–	OFF	
		PACER NON-CAPTURE*	ON, OFF	–	OFF	
			40 to 480 ms	4	400 ms	

* Available only when “EXTENDED” is selected for arrhythmia type on the SYSTEM SETUP window. The arrhythmia type setting is not available on the BSM-6000A series bedside monitors. For BSM-6000A series, arrhythmia type is STANDARD only.

DATE Window

Window	Page	Items	Setting Items	Default Setting	Backup
DATE	DATE	YEAR	2000 to 2099	–	OK
		MONTH	1 to 12		
		DAY	1 to 31		
		HOUR	0 to 23		
		MINUTE	0 to 59		

VOLUME Window

Window	Page	Items	Setting Items	Default Setting	Backup
VOLUME	VOLUME	SYNC SOUND VOLUME	ON, OFF	ON	OK
			0 to 7 (8 steps)	3	
		ALARM VOLUME	1 to 7 (7 steps)	5	

DISPLAY Window

Window	Page	Items	Setting Items	Default Setting	Backup
DISPLAY	BRIGHT	BRIGHTNESS	0 to 7 (8 steps)	7	OK
	WAVES	NO.ECG WAVES	1, 2, 3	1	
		PRESS SCALE	SEPARATE, COMMON, DUAL	COMMON	
		SWEEP SPEED	6 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s	25 mm/s	
		RESP/CO_2 SWEEP SPEED	1 mm/s, 6 mm/s, 12.5 mm/s, 25 mm/s	OR: 6 mm/s ICU: 25 mm/s NICU: 1 mm/s	
		WAVE DISPLAY	SpO_2, SpO_2-2*, EEG, EEG2, FLOW, Paw, VOL**, P1 to P7	All	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.
** Not available for BSM-6000A series.

RECORD Window

Window	Page	Items	Setting Items	Default Setting	Backup
RECORD	REC PARAMS	TRACES	ECG, ECG2, ECG3, RESP, SpO_2, SpO_2-2*, measuring PRESS labels, CO_2, O_2, N_2O, AGENT1, AGENT2, FLOW**, Paw**, VOL**, EEG, EEG2, FLOW(EXT), Paw(EXT), NONE	TRACE 1: ECG TRACE 2: NONE TRACE 3: NONE	OK
	OTHER	ALARM RECORDING	ON, OFF	OFF	
		RECORDING SPEED	12.5 mm/s, 25 mm/s, 50 mm/s	25 mm/s	
		PERIODIC REC INTERVAL (min)	OFF, FREE, 30, 60, 120, 5(OCRG), 15(OCRG), 30(PWTT)	OFF	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.
** Not available for BSM-6000A series.

ECG Window

Window	Page	Items		Setting Items	Default Setting	Backup
ECG	MAIN	SENSITIVITY		×1/4, ×1/2, AUTO, ×1, ×2, ×4	×1	OK
		LEAD		I, II, III, aVR, aVL, aVF, V1 to V6	II	
		ALARMS	HR/PR	The setting items and default setting are the same as the ALARM LIMITS setting in ECG ALARMS page.		Master
			VPC			
			ST-II			
	ST ALARMS	ALARMS	ST-I to ST-V6			
	ARRHYTH	ASYSTOLE, VF, VT, VPC RUN, COUPLET, EARHY VPC, BIGEMINY		The setting items and default setting are the same as the ALARM LIMITS setting in ARRHYTH ALARMS page.		
	OTHER	FILTERS	–	DIAG, MONITOR, MAXIMUM	OR, NICU: MAXIMUM ICU: MONITOR	OK
			HUM FILTER	ON, OFF	OFF	
		HR DISPLAY MODE		AVERAGE, INSTANT	AVERAGE	
		AUTO LEAD CHANGE		ON, OFF	OFF	
		PACING	DETECT	ON, OFF	OR, ICU: ON NICU: OFF	30 min
			MARK	ON, OFF	OFF	OK
		NUMBER OF ELECTRODES		STANDARD, INDIV 6, INDIV 10	STANDARD	
		SYNC PITCH		FIXED, PRESS, SpO_2, SpO_2-2*	FIXED	
		SYNC SOURCE	–	ECG, PRESS, SpO_2	ECG	
			PR DISPLAY	ON, OFF	OFF	
	ARRHYTH ANALYSIS	ARRHYTHMIA ANALYSIS		ON, OFF	ON	Master
		ARRHYTHMIA ANALYSIS METHOD		SINGLE, MULTIPLE	SINGLE	OK
		QRS DETECTION TYPE		ADULT, CHILD, NEONATE	OR, ICU: ADULT NICU: NEONATE	Master
	ECG2/3 WAVES	NO. ECG WAVES		1, 2, 3	1	OK
		ECG2 SENSITIVITY		×1/4, ×1/2, ×1, ×2, ×4	×1	
		ECG2 LEAD		I, II, III, aVR, aVL, aVF, V1 to V6	V4	
		ECG3 SENSITIVITY		×1/4, ×1/2, ×1, ×2, ×4	×1	
		ECG3 LEAD		I, II, III, aVR, aVL, aVF, V1 to V6	V5	
	V-LEADS	FREE LEAD a (Ca/Va)		V1 to V6	V4	
		FREE LEAD b (Cb/Vb)		V1 to V6	V5	
	ST POINT	ISO POINT		R –: 248 to 0 ms	OR, ICU: 80 ms NICU: 56 ms	30 min
		J POINT		R +: 0 to 340 ms	OR, ICU: 48 ms NICU: –	
		ST POINT		R +: 0 to ** ms	60 ms	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.

** When J point is set to R +: 340 ms, ST point is J + 0 ms.

RESP/CO$_2$ Window

Window	Page		Items		Setting Items	Default Setting	Backup
RESP/CO$_2$	MAIN		IMPEDANCE RESP LEAD		R-L, R-F	R-F	OK
			SENSITIVITY		×1/4, ×1/2, ×1, ×2, ×4	×1	
			ALARMS	RR	The setting items and default setting are the same as the ALARM LIMITS setting in MAIN ALARMS page.		Master
				APNEA			
				CO$_2$			
	SCALE	CO$_2$	–		0-20, 0-40, 0-80 mmHg or 0 (fixed) to 100 mmHg	0-40	OK
			–		0.0-2.5, 0.0-5.5, 0.0-10.5 kPa or 0.0 (fixed) to 13.5 mmHg	0.0-5.5 kPa	
	GAS COMP		GAS COMPOSITION	–	AIR, O$_2$+AIR, O$_2$+N$_2$O	OR: O$_2$+N$_2$O ICU, NICU: O$_2$+AIR	
				PERCENTAGE OF INSPIRED O$_2$	0 to 100%	21.0%	
	OTHER		IMPEDANCE MEASUREMENT		ON, OFF	OR: OFF ICU, NICU: ON	
			RESP/CO$_2$ SWEEP SPEED		1 mm/s, 6 mm/s, 12.5 mm/s, 25 mm/s	OR: 6 mm/s ICU: 25 mm/s NICU: 1 mm/s	

SpO$_2$ Window

Window	Page		Items		Setting Items	Default Setting	Backup
SpO$_2$	MAIN	SpO$_2$	SENSITIVITY		×1/8, ×1/4, ×1/2, ×1, AUTO, ×2, ×4, ×8	AUTO	OK
			ALARMS	SpO$_2$	The setting items and default setting are the same as the ALARM LIMITS setting in MAIN ALARMS page.		Master
				HR/PR			
		SpO$_2$-2*1	SENSITIVITY		×1/8, ×1/4, ×1/2, ×1, AUTO, ×2, ×4, ×8	AUTO	OK
			ALARMS	SpO$_2$-2	The setting items and default setting are the same as the ALARM LIMITS setting in MAIN ALARMS page.		Master
				ΔSpO$_2$			
	OTHER		SYNC SOURCE	–	ECG, PRESS, SpO$_2$	ECG	OK
				PR DISPLAY	ON, OFF	OFF	
			SYNC PITCH		FIXED, PRESS, SpO$_2$, SpO$_2$-2	FIXED	
			RESPONSE*2		FAST, NORMAL, SLOW	NORMAL	
			AVERAGE TIME(S)*3		2, 4, 8, 10, 12, 14, 18	8	
			SENSITIVITY MODE*3		MAX, NORMAL, APOD	NORMAL	
			SpO$_2$ SENSITIVITY MODE*2		MAX, NORMAL	NORMAL	–
			SpO$_2$-2 SENSITIVITY MODE*6		MAX, NORMAL	NORMAL	
			FAST SAT*3		ON, OFF	OFF	OK
	NUMERIC DISPLAY		NUMERIC DISPLAY ON HOME SCREEN FOR SpO$_2$*4	PR	ON, OFF	OFF	OK
				PI*5	ON, OFF	OFF	
			NUMERIC DISPLAY ON HOME SCREEN FOR SpO$_2$-2	PR*6	ON, OFF	OFF	
				ΔSpO$_2$	ON, OFF	OFF	

*1 SpO$_2$-2 page is displayed when JL-500P1 or JL-500P2 SpO$_2$ adapter is connected to the AY-661P, AY-663P, AY-671P or AY-673P input unit or IF-919P or IF-925P communication cable is used. The PR alarm setting is not available when IF-919P or IF-925P communication cable is used. JL-500P2 SpO$_2$ adapter and AY-660P, AY-661P and AY-663P input units are not available for BSM-6000A series.

*2 Available only when an AY-660P, AY-661P, AY-663P, AY-671P and AY-673P input unit is used.

*3 Available only when an AY-631P or AY-633P input unit is used.

*4 Available only when an AY-631P, AY-633P, AY-660P, AY-661P, AY-663P, AY-671P and AY-673P input unit is used.

*5 Available only when an AY-631P or AY-633P input unit or IF-925P communication cable is used.

*6 Available only when an JL-500P1 or JL-500P2 SpO$_2$ adapter is connected to the AY-661P, AY-663P, AY-671P or AY-673P input unit.

NIBP Window

Window	Page	Items		Setting Items	Default Setting	Backup
NIBP	MAIN	INITIAL CUFF PRESSURE TYPE		ADULT, CHILD, NEONATE	ADULT	OK
		MEASUREMENT INTERVAL		MANUAL, STAT, SIM, 1 min, 2 min, 2.5 min, 5 min, 10 min, 15 min, 30 min, 1 h, 2 h, 4 h, 8 h	MANUAL	Master
		ALARMS	SYS	The setting items and default setting are the same as the ALARM LIMITS setting in MAIN ALARMS page.		
			DIA			
			MAP			
	PWTT	PWTT MEASUREMENT		ON, OFF	OFF	OK
		TRIGGER TIME		5 to 30 ms	15 ms	
	OTHER	INITIAL CUFF PRESSURE	ADULT	100 to 280 mmHg	180 mmHg	–
				13.0 to 37.0 kPa	24.0 kPa	
			CHILD	100 to 280 mmHg	140 mmHg	
				13.0 to 37.0 kPa	19.0 kPa	
			NEONATE	70 to 120 mmHg	100 mmHg	
				9.0 to 16.0 kPa	13.0 kPa	

PRESS Window

Window	Page	Items		Setting Items	Default Setting	Backup
PRESS	MAIN	ALARMS	SYS	The setting items and default setting are the same as the PRESS1 to PRESS3 ALARMS settings of ALARM LIMITS in MAIN ALARMS page.		Master
			DIA			
			MEAN			
			HR/PR			
	SCALE	ART, ART2, RAD, DORS, AO, LVP, FEM, P1 to P7		0-20, 0-50, 0-100, 0-160, 0-200, 0-300 mmHg or 0 to 300 mmHg	OR, ICU: 0-200 mmHg NICU: 0-100 mmHg	OK
				0.0-2.5, 0.0-6.5, 0.0-13.5, 0.0-21.5, 0.0-26.5, 0.0-40.0 kPa or 0.0 to 40.0 kPa	OR, ICU: 0.0-26.5 kPa NICU: 0.0-13.5 kPa	
		UA		0-20, 0-50, 0-100, 0-160, 0-200, 0-300 mmHg or 0 to 300 mmHg	0-100 mmHg	
				0.0-2.5, 0.0-6.5, 0.0-13.5, 0.0-21.5, 0.0-26.5, 0.0-40.0 kPa or 0.0 to 40.0 kPa	0.0-13.5 kPa	
		PAP, CVP, RAP, UV, RVP, LAP, ICP ICP2 to ICP4		0-20, 0-50, 0-100, 0-160, 0-200, 0-300 mmHg or 0 to 300 mmHg	0-50 mmHg	
				0.0-2.5, 0.0-6.5, 0.0-13.5, 0.0-21.5, 0.0-26.5, 0.0-40.0 kPa or 0.0 to 40.0 kPa	0.0-6.5 kPa	
	LABEL	SELECTABLE ITEMS	P1 to P7, ART, ART2, RAD, DORS, AO, FEM, UA, UV, PAP, CVP, RAP, RVP, LAP, LVP, ICP, ICP2 to ICP4	–	–	–
	OTHER	SYNC SOURCE	–	ECG, PRESS, SpO_2	ECG	OK
			PR DISPLAY	ON, OFF	OFF	
		CALCULATION METHOD		STANDARD, PEAK	STANDARD	
		CPP DISPLAY		ON, OFF	OFF	
		SYNC PITCH		FIXED, PRESS, SpO_2, SpO_2-2*	FIXED	
		PRESS SCALE		SEPARATE, COMMON, DUAL	COMMON	
		NUMERIC DISPLAY	ART, ART2, RAD, DORS, AO, FEM, PAP, RVP, LVP, P1 to P7	SYS/DIA (MEAN), MEAN	SYS/DIA (MEAN)	
			UA	MAX/MIN (MEAN), MEAN	MAX/MIN (MEAN)	
			UV, CVP, RAP, LAP, ICP, ICP2 to ICP4		MEAN	
		PPV/SPV DISPLAY		PPV, SPV, OFF	OFF	
		PPV/SPV AVERAGE TIME		1 min, 5 min	1 min	

* Available only when an AY-661P, AY-663P, AY-671P or AY-673P input unit is used.

TEMP Window

Window	Page	Items		Setting Items	Default Setting	Backup
TEMP	MAIN	ALARMS	Measuring label, ΔT, ΔT2	The setting items and default setting are the same as the ALARM LIMITS setting in TEMP ALARMS page.		Master
	LABEL	SELECTABLE ITEMS		T1 to T4, Tskin, Tskin2, Tskin3, Tcore, Tnaso, Teso, Tblad, Trect, Ttymp, Taxil, Tb, NONE	–	–
	OTHER	ΔT SITES		T1 to T4, Tskin, Tskin2, Tskin3, Tcore, Tnaso, Teso, Tblad, Trect, Ttymp, Taxil, Tb, NONE	T1 – T2	OK
		ΔT2 SITES		T1 to T4, Tskin, Tskin2, Tskin3, Tcore, Tnaso, Teso, Tblad, Trect, Ttymp, Taxil, Tb, NONE	T3 – T4	

BIS Window

Window	Page	Items		Setting Items	Default Setting	Backup
BIS	MAIN	SENSITIVITY		10, 20, 30, 50, 70, 100, 150, 200	30	OK
		ALARMS	BIS	The setting items and default setting are the same as the ALARM LIMITS setting in MAIN ALARMS page.		Master
	OTHER	FILTER		ON, OFF	ON	OK
		SMOOTHING RATE		10 s, 15 s, 30 s	15 s	
		AUTO CHECK		ON, OFF	ON	
		EEG SWEEP SPEED		6 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s	25 mm/s	
		PARAMETER FOR 2ND CURRENT TREND		OFF, EMG, SQI, SR	EMG	

CO Window

Window	Page	Items		Setting Items	Default Setting	Backup
CO	CATHETER	CATHETER		Edwards, BD, CONSTANT	Edwards	OK
		INJECTATE TEMPERATURE MEASURING METHOD		BATH, INLINE	BATH	
		INJECTATE VOLUME		10 cc, 5 cc, 3 cc	10 cc	
		CATHETER SIZE	Edwards	8 F, 7.5 F, 7 F, 6 F, 5.5 F	7.5 F	
			BD	7.5 F, 7 F, 6 F, 5 F		
		CONSTANT		0.001 to 1.000	0.564	
	HEIGHT/WEIGHT	HEIGHT		0.0 to 299.9 cm	–	–
				0.1 to 118.0 inch (9 ft 11.9 inch)		
		WEIGHT		0.00 to 449.9 kg		
				0.1 to 654.9 pound		
	ALARMS	Tb		The setting items and default setting are the same as the ALARM LIMITS setting in TEMP ALARMS page.		Master

GAS Window

Window	Page		Items	Setting Items	Default Setting	Backup
GAS	SCALE	CO_2	–	0-20, 0-40, 0-80 mmHg or 0 (fixed) to 100 mmHg	0-40 mmHg	OK
			–	0.0-2.5, 0.0-5.5, 0.0-10.5 kPa or 0.0 (fixed) to 13.5 kPa	0.0-5.5 kPa	
		O_2	–	30-60, 0-60, 0-100% or 0 to 100%	0-100%	
		N_2O	–	0-80, 0-100, 50-80% or 0 to 100%	50-80%	
		HAL, ISO, ENF, SEV, DES	–	0.0-4.0, 0.0-8.0, 0.0-20.0 mmHg or 0.0 to 20.0 mmHg	0.0-8.0 mmHg	
	ALARMS		RR, APNEA, CO_2(E), CO_2(I), O_2(E), O_2(I), N_2O(E), N_2O(I), HAL(E), HAL(I), ISO(E), ISO(I), ENF(E), ENF(I), SEV(E), SEV(I), DES(E), DES(I)	The setting items and default setting are the same as the ALARM LIMITS settings in GAS ALARMS page.		Master
	SAMPLING*[1]		SAMPLING MODE	AUTO, MANUAL	AUTO	–
			SAMPLING VOLUME	120 to 200 mL/min	120	
	OTHER		NUMERIC DISPLAY	O_2(E), O_2(I), N_2O(E), N_2O(I), AGENT1(E), AGENT1(I), AGENT2(E), AGENT2(I), MAC, NONE	RR (fixed), CO_2(E) (fixed), O_2(I), AGENT1(I), NONE	OK
			CO_2(I) DISPLAY	ON, OFF	OFF	
			GAS MEASUREMENT*[2]	ON, OFF	ON	

*[1] SAMPLING page is not displayed when the GF-210R multigas unit or GF-220R multigas/flow unit is connected to the monitor.

*[2] Available only when a GF-110PA or GF-210R multigas unit or GF-120PA or GF-220R multigas/flow unit is used.

O_2 Window

Window	Page		Items	Setting Items	Default Setting	Backup
O_2	MAIN	ALARMS	O_2(I)	The setting items and default setting are the same as the ALARM LIMITS settings in GAS ALARMS page.		Master

VENT Window

Window	Page		Items	Setting Items	Default Setting	Backup
VENT	SCALE	Paw	–	0-10, 0-20, 0-50, 0-100, 0-150 or 0 (fixed) to 150	0-50	OK
		FLOW	–	-1.0-+1.0, -2.0-+2.0, -3.0-+3.0 or –3.0-+3.0	-1.0-+1.0	
	OTHER		NUMERIC DISPLAY	Pmean, MV, PEEP, O_2(I), Ppeak, setO_2(I), TV, NONE	MV, TV, O_2(I), Pmean	

CCO Window

Window	Page	Items	Setting Items	Default Setting	Backup
CCO (CCO, CCO/ $S\bar{v}O_2$)	OTHER	NUMERIC DISPLAY	CCO, SVRI, $S\bar{v}O_2$, Tb, EF, $Sc\bar{v}O_2$, CCI, EDV, SVR, EDVI, NONE	CCO, SVR, EF, Tb	OK
CCO (PiCCO)	OTHER	NUMERIC DISPLAY	ABSOLUTE, INDEX	INDEX	OK

FLOW/Paw Window

FLOW/Paw monitoring is not available for BSM-6000A series.

Window	Page	Items	Setting Items		Default Setting	Backup
FLOW/Paw	SCALE	FLOW	–0.3-+0.3, –0.5-+0.5, –1.0-+1.0, –2.0-+2.0, –3.0-+3.0,		–1.0-+1.0	OK
		Paw	0-10, 0-20, 0-50, 0-100		0-50	
		VOL	0-150, 0-300, 0-500, 0-1000, 0-2000		0-500	
	ALARM	ALARMS	MV	The setting items and default setting are the same as the ALARM LIMITS settings in OTHER ALARMS page.		Master
			Ppeak			
			PEEP			
			RR			
			APNEA			
	LOOPS	P-V	SCALE	The setting items and default settings are the same as the SCALE page.	Scale of VOL and Paw.	OK
			NUMERIC DISPLAY	Ppeak, TVe, C, Pmean, TVi, R, PEEP, MV, Re, RR, I:E, Ri, NONE	Ppeak, MV, C, PEEP, I:E, R	
		F-V	SCALE	The setting items and default settings are the same as the SCALE page	Scale of FLOW and VOL.	
			NUMERIC DISPLAY	Ppeak, TVe, C, Pmean, TVi, R, PEEP, MV, Re, RR, I:E, Ri, NONE	Ppeak, MV, C, PEEP, I:E, R	
		REFERENCE	LOOP TYPE	P-V, F-V	P-V	
			REFERENCE LOOPS	ON, OFF	ON	
			SCALE	The setting items and default setting are the same as the SCALE page.	Scale of VOL and Paw.	
		SETTINGS	SHOW LOOPS ON HOME SCREEN	P-V, F-V, OFF	P-V	
			NUMBER OF LOOP	1, 3	1	
	GAS COMP		GAS COMPOSITION	O_2	21.0%	OK
				N_2O	0.0%	
				HAL, ISO, ENF, SEV, DES	0.0%	
				N_2	79.0%	
			TEMPERATURE AND HUMIDITY	TEMP	37.0°C	
				HUMIDITY	100.0%	
	OTHER		NUMERIC DISPLAY	The settings items are the same as the LOOPS page.	MV, TVe, Ppeak, PEEP, C, R	OK

EEG Window

EEG monitoring is not available for BSM-6000A series.

Window	Page	Items			Setting Items	Default Setting	Backup
EEG	MEASURE	SENSITIVITY			1, 2, 3, 5, 7, 10, 15, 20, 30, 50, 75, 100, 150, 200 μV/mm	10 μV/mm	OK
	ALARM	ALARMS			SEF	The setting items and default setting are the same as the ALARM LIMITS settings in OTHER ALARMS page.	Master
					TP		
	MONTAGE	IMP CHECK	IMPEDANCE THRESHOLD		2, 5, 10, 20, 50 kΩ	10 kΩ	OK
		OTHER	1 10 ELECTRODES	ELECTRODE POSITION	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz	1-A1, 2-A2, 3-F3, 4-F4, 5-C3, 6-C4, 7-P3, 8-P4, 9-O1, 10-O2	
				MONTAGE	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz, 0V	EEG1: F3-A1, EEG2: F4-A2, EEG3: C3-A1, EEG4: C4-A2, EEG5: P3-A1, EEG6: P4-A2, EEG7: O1-A1, EEG8: O2-A2	
			2 10 ELECTRODES	ELECTRODE POSITION	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz	1-A1, 2-A2, 3-Fp1, 4-Fp2, 5-F7, 6-F8, 7-T3, 8-T4, 9-T5, 10-T6	
				MONTAGE	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz, 0V	EEG1: Fp1-A1, EEG2: Fp2-A2, EEG3: F7-A1, EEG4: F8-A2, EEG5: T3-A1, EEG6: T4-A2, EEG7: T5-A1, EEG8: T6-A2	
			3 10 ELECTRODES	ELECTRODE POSITION	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz	1-A1, 2-A2, 3-Fp1, 4-Fp2, 5-C3, 6-C4, 7-O1, 8-O2, 9-T3, 10-T4	
				MONTAGE	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz, 0V	EEG1: Fp1-A1, EEG2: Fp2-A2, EEG3: C3-A1, EEG4: C4-A2, EEG5: O1-A1, EEG6: O2-A2, EEG7: T3-A1, EEG8: T4-A2	
			4 10 ELECTRODES	ELECTRODE POSITION	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz	1-A1, 2-A2, 3-Fp1, 4-Fp2, 5-C3, 6-C4, 7-O1, 8-O2, 9-T3, 10-T4	
				MONTAGE	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz, 0V	EEG1: Fp1-0V, EEG2: Fp2-0V, EEG3: C3-0V, EEG4: C4-0V, EEG5: O1-0V, EEG6: O2-0V, EEG7: T3-0V, EEG8: T4-0V	
			5 4 ELECTRODES	ELECTRODE POSITION	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz	1-C3, 2-A1, 3-C4, 4-A2	
				MONTAGE	A1, A2, T3, T4, T5, T6, F7, F8, F3, F4, Fz, Fp1, Fp2, C3, C4, Cz, P3, P4, Pz, O1, O2, Oz, 0V	EEG1: C3-A1, EEG2: C4-A2	
	OTHER	DISPLAY	NUMERIC DISPLAY	CHANNELS PAIR	EEG1, EEG2, EEG3, EEG4, EEG5, EEG6, EEG7, EEG8	EEG1, EEG2	OK
				PARAMETERS PAIR	SEF, MDF, PPF, TP, ABS DELTA, ABS THETA, ABS ALPHA, ABS BETA, ABS GAMMA, %DELTA, % THETA, % ALPHA, % BETA, % GAMMA	SEF, TP	
		OTHER	SEF		90, 95%	95%	OK
			AMPLITUDE LIMIT		ON, OFF	OR: ON ICU, NICU: OFF	
			LOW CUT FILTER		0.08, 0.16, 0.27, 0.53, 1.6, 5.3 Hz	0.53 Hz	
			AC FILTER		ON, OFF	OFF	
			HIGH CUT FILTER		15, 30, 35, 60, 70 Hz	30 Hz	

12 LEAD ANALYSIS Window

Window	Page	Items	Setting Items	Default Setting	Backup
12 LEAD ANALYSIS	12 LEAD ANALYSIS		5 mm/mV, 10 mm/mV, 20 mm/mV	10 mm/mV	OK
	PATIENT INFORMATION	DATE OF BIRTH	254 YEARS 11 MONTHS 30 DAYS before to the present date	–	30 min
		AGE (calculated automatically)	0 YEAR 0 MONTH 0 DAY to AGE 254 YEARS 11 MONTHS 30 DAYS		
		GENDER	MALE, FEMALE, NONE	NONE	

DRUG Window

Window	Page	Items		Setting Items	Default Setting	Backup
DRUG	DRUG	AMRINONE	DRUG AMOUNT (mg)	0.01 to 2000.00	500.00	OK
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/kg/min)	0.01 to 500.00	–	30 min
			SAMPLE RATE (mL/h)	0.1 to 600.0		
			WEIGHT (kg)	0.1 to 449.9		
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	OK
		AMINOPHYLLINE	DRUG AMOUNT (mg)	0.01 to 2000.00	500.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mg/kg/h)	0.01 to 500.00	–	30 min
			SAMPLE RATE (mL/h)	0.1 to 600.0		
			WEIGHT (kg)	0.1 to 449.9		
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	OK
		BRETYLIUM	DRUG AMOUNT (mg)	0.01 to 2000.00	2000.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mg/min)	0.01 to 500.00	1.00	
			SAMPLE RATE (mL/h)	0.1 to 600.0	7.5	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		DOBUTAMINE	DRUG AMOUNT (mg)	0.01 to 2000.00	250.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/kg/min)	0.01 to 500.00	–	30 min
			SAMPLE RATE (mL/h)	0.1 to 600.0		
			WEIGHT (kg)	0.1 to 449.9		
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	OK
		DOPAMINE	DRUG AMOUNT (mg)	0.01 to 2000.00	800.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/kg/min)	0.01 to 500	–	30 min
			SAMPLE RATE (mL/h)	0.1 to 600.0	7.5	
			WEIGHT (kg)	0.1 to 449.9	–	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	OK
		EPINEPHRINE	DRUG AMOUNT (mg)	0.01 to 2000.00	4.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/min)	0.01 to 500.00	1.00	
			SAMPLE RATE (mL/h)	0.1 to 600.0	3.8	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	

Window	Page	Items		Setting Items	Default Setting	Backup
DRUG	DRUG	HEPARIN	DRUG AMOUNT (units)	100 to 150000	25000	OK
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (units/h)	10 to 15000	1000	
			SAMPLE RATE (mL/h)	0.1 to 600.0	10.0	
			DOSE STEP	10, 50, 100, 500	50	
		INSULIN	DRUG AMOUNT (units)	0.01 to 2000.00	100.00	
			BASE VOLUME (mL)	1 to 1000	100	
			DOSE (units/h)	0.01 to 500.00	1.00	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		ISOPROTERENOL	DRUG AMOUNT (mg)	0.01 to 2000.00	2.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/kg/min)	0.01 to 500.00	–	30 min
			SAMPLE RATE (mL/h)	0.1 to 600.0		
			WEIGHT (kg)	0.1 to 449.9		
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	OK
		LIDOCAINE PROCAINAMIDE	DRUG AMOUNT (mg)	0.01 to 2000.00	2000.00	OK
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mg/min)	0.01 to 500.00	2.00	
			SAMPLE RATE (mL/h)	0.1 to 600.0	15.0	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		NITROGLYCERIN	DRUG AMOUNT (mg)	0.01 to 2000.00	50.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/min)	0.01 to 500.00	100.00	
			SAMPLE RATE (mL/h)	0.1 to 600.0	30.0	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		NITROPRUSSIDE	DRUG AMOUNT (mg)	0.01 to 2000.00	50.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/kg/min)	0.01 to 500.00	–	30 min
			SAMPLE RATE (mL/h)	0.1 to 600.0		
			WEIGHT (kg)	0.1 to 449.9		
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	OK
		NOREPINEPHRINE	DRUG AMOUNT (mg)	0.01 to 2000.00	4.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/min)	0.01 to 500.00	2.00	
			SAMPLE RATE (mL/h)	0.1 to 600.0	7.5	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		PHENYLEPHRINE	DRUG AMOUNT (mg)	0.01 to 1500000.00	300.00	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (mcg/min)	0.01 to 1500000.00	100.00	
			DOSE STEP	0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		STREPTOKINASE	DRUG AMOUNT (IU)	1000 to 1500000	750000	
			BASE VOLUME (mL)	1 to 1000	250	
			DOSE (IU/h)	1000 to 1500000	30000	
			SAMPLE RATE (mL/h)	0.1 to 600.0	10.0	
			DOSE STEP	5000, 10000, 50000	5000	

Window	Page	Items			Setting Items	Default Setting	Backup
DRUG	DRUG	tPA	DRUG AMOUNT (mg)		0.01 to 2000.00	100.00	OK
			BASE VOLUME (mL)		1 to 1000	200	
			DOSE (mg/h)		0.01 to 500.00	20.00	
			SAMPLE RATE (mL/h)		0.1 to 600.0	40.0	
			DOSE STEP		0.01, 0.05, 0.10, 1.00, 10.00	0.10	
		DRUG A to DRUG D	DRUG NAME		Up to 16 alphanumeric characters	Drug A, Drug B, Drug C, Drug D	
			DOSE UNIT		mg/h, mg/min, mg/kg/h, mg/kg/min, mcg/h, mcg/min, mcg/kg/h, mcg/kg/min, units/h, IU/h	mcg/kg/min	
			DRUG AMOUNT	mg	0.01 to 2000.00	500.00	
				units	100 to 150000	–	
				IU	1000 to 1500000		
			BASE VOLUME (mL)		1 to 1000	250	
			DOSE		mg/h, mg/min, mcg/h, mcg/min	0.01 to 500.00	
					mg/kg/h, mg/kg/min, mcg/kg/h, mcg/kg/min		30 min
					units/h	10 to 15000	OK
					IU/h	1000 to 1500000	
			SAMPLE RATE (mL/h)		0.1 to 600.0	–	
			WEIGHT (kg)		0.1 to 449.9		30 min
		DRUG A to DRUG D	DOSE STEP		0.01, 0.05, 0.10, 1.00, 10.00, 10, 50, 100, 500, 5000, 10000, 50000	0.10	OK

LUNG FUNCTION Window

Window	Page	Items	Setting Items	Default Setting	Backup
LUNG FUNCTION	DATA ENTRY	HEIGHT	0.1 to 299.9 cm/inch	–	–
		WEIGHT	0.1 to 499.9 kg/pound		
		CO	1 to 20.0 L/min		
		O_2	1 to 100%		
		ATM	235 to 795 mmHg/kPa		
		$PaCO_2$	0 to 200 mmHg/kPa		
		Hb	0.1 to 50.0 g/dL/mmol/L		
		PaO_2	0 to 800 mmHg/kPa		
		SaO_2	1 to 100%		
		$P\bar{v}O_2$	1 to 100 mmHg/kPa		
		$S\bar{v}O_2$	0 to 99%		

INTERBED Window

Window	Page	Items	Setting Items	Default Setting	Backup
INTERBED	SETTINGS	INTERBED ALARM	ON, OFF	OFF	OK
		AUTO INTERBED DISPLAY	ON, OFF	OFF	
	SELECT BED	SELECTED BEDS	Select from up to 16 beds	NONE	
		GROUP	General, CCU, CCU-1, CCU-2, ER, ICU, ICU-1, ICU-2, OR, Post CCU, Recovery, Tele-1 to Tele-5	General	

Standard Accessories

MU-631RA/MU-651RA/MU-671RA Main Unit

Name	Qty	Model/Code No.	Supply Code No.
Power cord UL	1	094577	–
Operator’s Manual	1	0614-900685H	–
BSM-6000 series Manuals CD-ROM	1	0644-900031E	–

MU-631RK/MU-651RK/MU-671RK Main Unit

Name	Qty	Model/Code No.	Supply Code No.
Operator’s Manual	1	0614-900685H	–
BSM-6000 series Manuals CD-ROM	1	0644-900031E	–

Options/Consumables

Each component has its own options.

CAUTION

Only use Nihon Kohden specified electrodes, probes, transducers, thermistors and catheters. Otherwise, the maximum performance from the monitor cannot be guaranteed.

NOTE:

- Only use Nihon Kohden specified parts and accessories to assure maximum performance from your instrument.
- The parts which are marked with * have not been checked for compliance with the MDD (Medical Device Directive). For EC member countries, Nihon Kohden recommends the use of parts that comply with MDD.

Accessory Set

Items / **Model**	**YO-60IY1** (IEC type)	**YO-60IY2** (IEC type)	**YO-60IY3** (IEC type)	**YO-60IY4** (IEC type)	**YO-60AY1** (AHA type)	**YO-60AY2** (AHA type)	**YO-60AY3** (AHA type)	**YO-60AY4** (AHA type)
ECG electrode lead (3 electrodes), BR-903P	✓	✓	✓	✓	–	–	–	–
ECG electrode lead (3 electrodes), BR-903PA	–	–	–	–	✓	✓	✓	✓
ECG connection cord (3/6 electrodes), JC-906P	✓	✓	✓	✓	–	–	–	–
ECG connection cord (3/6 electrodes), JC-906PA	–	–	–	–	✓	✓	✓	✓
Disposable electrode, Vitrode L-150	✓	✓	✓	✓	✓	✓	✓	✓
SpO_2 connection cord, JL-900P	✓	✓	–	–	✓	✓	–	–
Air hose for adult/child (3.5 m), YN-901P	✓	✓	✓	✓	✓	✓	✓	✓
Cuff for adult, standard, YP-963T	✓	–	✓	–	✓	–	✓	–
Cuff for adult, large, YP-964T	–	✓	–	✓	–	✓	–	✓

MU-631RA/MU-651RA/MU-671RA Main Unit

Name	Qty	Model/Code No.	Supply Code No.
Upgrade software for upgrading the system software and language of a BSM-6000A series bedside monitor	1	QS-028PA	–
Battery pack	1	SB-671P	–
Isolation transformer	1	SM-800RJ/SM-800RK	–
Battery charger	1	SB-610RA	–
Touch pen	1	577297	–
Remote controller	1	RY-910PA	–
Alkaline batteries, AAA	40	–	X093A
Mouse, Basic Optical Mouse	1	908109	–
Bar code reader, Symbol LS2208	1	–	–
Upgrade software for upgrading the SpO_2 software of an AY-660P/661P/663P/671P/673P input unit	1	QS-042P	–
Memory card	1	QM-601P	–
Administrator’s Guide	1	0614-901238G	–
User’s Guide Part I	1	0614-900676G	–
User’s Guide Part II	1	0614-901229G	–
Service Manual	1	0634-900184D	–
ECAPS12C User’s Guide	1	0614-006465	–

MU-631RK/MU-651RK/MU-671RK Main Unit

Name	Qty	Model/Code No.	Supply Code No.
Grounding lead	1	544582	–
Power cord GB	1	483415	–
Power cord H	1	186656	–
Power cord N	1	314839	–
Power cord W	1	186683	–
Transmitter	1	ZS-900PG/ZS-900PK	–
Upgrade software for upgrading the system software and language of a BSM-6000K series bedside monitor	1	QS-028P	–
Battery pack	1	SB-671P	–
Battery charger	1	SB-610RK	–
Isolation transformer	1	SM-800RJ/SM-800RK	–
Touch pen	1	577297	–
Remote controller	1	RY-910PA	–
Alkaline batteries, AAA	40	–	X093A
Mouse, Basic Optical Mouse	1	908109	–
Bar code reader, Symbol LS2208	1	–	–
Upgrade software for upgrading the SpO_2 software of an AY-660P/661P/663P/671P/673P input unit	1	QS-042P	–
Memory card	1	QM-601P	–
Administrator’s Guide	1	0614-901238G	–
User’s Guide Part I	1	0614-900676G	–
User’s Guide Part II	1	0614-901229G	–
Service Manual	1	0634-900184D	–
ECAPS12C User’s Guide	1	0614-006465	–

WS-671P Recorder Module

Name	Qty	Code No.	Supply Code No.
Recording paper	10	FQW50-2-100	A721
Thermal head cleaner pen	5	–	Y011

Units and Modules

Name	Qty	Model	Supply Code No.
Input unit (with 1 MULTI socket and Masimo SpO_2 socket)	1	AY-631P	–
Input unit (with 1 MULTI socket and Nellcor SpO_2 socket)	1	AY-651P	–
Input unit (with 1 MULTI socket, 1 TEMP socket and Nihon Kohden SpO_2 socket)	1	AY-660P***	–
Input unit (with 1 MULTI socket and Nihon Kohden SpO_2 socket)	1	AY-661P**	–
	1	AY-671P**	–
Input unit (with 3 MULTI socket and Masimo SpO_2 socket)	1	AY-633P	–
Input unit (with 3 MULTI socket and Nellcor SpO_2 socket)	1	AY-653P	–
Input unit (with 3 MULTI sockets and Nihon Kohden SpO_2 socket)	1	AY-663P**	–
	1	AY-673P**	–
Memory unit	1	QM-600P	–
Smart expansion unit (2 MULTI sockets)	1	AA-672P	–
Smart expansion unit (4 MULTI sockets)	1	AA-674P	–
CO_2 unit	1	AG-400RK	–
Multigas unit	1	AG-920RA/AG-920RK	–
Multigas unit	1	GF-110PA	–
Multigas unit	1	GF-210R***	–
Multigas/flow unit	1	GF-120PA***	–
Multigas/flow unit	1	GF-220R***	–
BIS processor	1	QE-910P	–
Neuro unit	1	AE-918P***	–
Handle for input unit	1	DH-600P	–
Data acquisition unit	1	JA-690PA/JA-694PA	–
Multi-link cable for connecting data acquisition unit	1	YS-096P5	–
Unit connection cable 2.5 m for connecting data acquisition unit	1	YS-096P2	–
Unit connection cable 5 m for connecting data acquisition unit	1	YS-096P3	–

** For the differences between AY-661P and AY-671P, and AY-663P and AY-673P, contact your Nihon Kohden representative.

***These units are not available for BSM-6000A series.

Network

Name	Qty	Model/Code No.	Supply Code No.
Hyper isolation transformer	1	QW-100Y (HIT-100)	–
Serial connection cable	1	YS-089P2	–
Wireless LAN station	1	QI-320PA	–
Wireless LAN station	1	QI-610PA	–

Interfaces for Connecting External Instruments

Name	Qty	Cable Length (m)	Model
Interface for BSM-6301A/K (1 RS-232C socket, 1 RGB socket)	1	–	QI-631P
Interface for BSM-6301A/K (1 USB socket, 1 Multi-link socket, 1 Alarm socket)	1	–	QI-632P
Interface for BSM-6301A/K (1 USB socket, 1 Multi-link socket)	1	–	QI-634P
Interface for BSM-6501A/K and BSM-6701A/K (1 Multi-link socket, 1 RS-232C socket, 1 Alarm socket, 1 RGB socket)	1	–	QI-671P
Interface for BSM-6501A/K and BSM-6701A/K (2 USB sockets, 4 Multi-link sockets)	1	–	QI-672P
Interface unit for connecting data acquisition unit	1	–	QI-600P
Interface for connecting Drager ventilator	1	2.5	QF-901P
Interface for connecting A-2000 BIS monitor	1	2.5	QF-902P
Interface for connecting Vigilance monitor	1	2.5	QF-903P
Interface for connecting AG-920R multigas unit	1	2.5	QF-904P
Interface for connecting AG-400R CO_2 unit	1	2.5	QF-905P**
Interface for connecting Puritan Bennett ventilator	1	2.5	QF-907P
Interface for connecting MAQUET ventilator	1	2.5	QF-908P
Interface for connecting Organon neuromuscular transmission monitor	1	2.5	QF-909P
Interface for connecting Pulsion PiCCO plus/$PiCCO_2$	1	2.5	QF-911P
Interface for connecting Oridion Microcap® monitor	1	2.5	QF-921P***
Communication cable for connecting Radiometer MicroGas 7650 *rapid* transcutaneous monitor	1	2.5	IF-913P
Communication cable for connecting Radiometer TCM4 or TCM40 transcutaneous monitor	1	2.5	IF-914P
Communication cable for connecting Newport Medical Instruments ventilator	1	2.5	IF-916P
Communication cable for connecting Hamilton Medical ventilator	1	2.5	IF-917P**
Communication cable for connecting a Covidien-Nellcor OxiMax™ N-600x™ pulse oximeter	1	2.5	IF-919P
Communication cable for connecting Drager Medical Primus/Fabius® anesthesia workstation	1	2.5	IF-920P**
Communication cable for connecting Hospira SO_2/CCO monitor	1	2.5	IF-922P
Communication cable for connecting Puritan Bennett ventilator, 7200	1	2.5	IF-923P
Communication cable for connecting a Masimo pulse oximeter	1	2.5	IF-925P

** QF-905P and IF-920P interfaces and IF-917P communication cable are not available for BSM-6000A series.

***QF-921P interface is not available for BSM-6000K series.

Cart and Attaching Parts

Name	Qty	Model
Cart	1	KC-600P
Wall mount kit	1	KG-951P
Holder for transmitter	1	DI-590P
Mount adapter for mounting bedside monitor on the GF-210R multigas unit or GF-220R multigas/flow unit	1	DH-220P
Unit mount for mounting GF-210R multigas unit or GF-220R multigas/flow unit on the KC-600P cart	1	DH-223P

For ECG and Respiration (Impedance Method) Monitoring

Name	Purpose		Length (m)	Qty	Code No.	Supply Code No.
Electrode lead	3 electrodes	IEC, clip type	0.8	1	BR-903P	K911
		AHA, clip type			BR-903PA	K911A
	6 electrodes	IEC, clip type			BR-906P	K912
		AHA, clip type			BR-906PA	K912A
ECG connection cord	3/6 electrodes (IEC)		3		JC-906P	K922
	3/6 electrodes (AHA)				JC-906PA	K922A
	10 electrodes (IEC)		3		JC-900P	K921
	10 electrodes (AHA)				JC-900PA	K921A
ECG patient cable	10 electrodes (IEC)		3.8		BJ-900P	K901
	10 electrodes (AHA)				BJ-900PA	K901A
ECG/BP output cable	Connects to other equipment for signal output (5 m)		–	1	YJ-910P	K974
	Connects to other equipment for signal output (0.3 m, horn jack type)		–	1	YJ-920P	K975
Disposable electrodes, Vitrode	General		–	3 × 50	F-150M	G210D
					F-150U3	G209A
					F-150U5	G209B
				30 × 5	L-150	G203
	General, X-ray		–	30 × 5	L-150X	G207
	General with DIN type lead		1.0	3 × 30	V-090M3	G272A
			1.5		V-09IO3	G278A
			1.0	4 × 10	V-040M4	G272B
			1.5		V-04IO4	G273A
			1.0	6 × 10	V-060M6	G272C
			1.5		V-06IO6	G274A
	For neonates and premature infants For NICU		–	3 × 50	F-150S	G210C
Disposable electrodes, Vitrode	For neonates and premature infants For NICU With DIN type lead		60 cm	3 × 40	V-120S3	G271A
			60 cm	3 × 10	N-03IS3	G300A

For Respiration Monitoring (Thermistor Method)

Name	Length (m)	Qty	Code No.	Supply Code No.
Respiration pickup for nose	3	1	TR-900P*	P901
Respiration pickup for airway	3	1	TR-910P	P902
Airway adapter	–	1	YG-001P	V911

For CO_2 Monitoring (Mainstream Method)

Name	Length (m)	Qty	Code No.	Supply Code No.
CO_2 sensor kit (CO_2 adapter + CO_2 sensor) for semi-quantitative method	3	1	TG-900P	P903
CO_2 adapter for TG-900P	2	1	JG-900P	K981
CO_2 sensor for TG-900P	1	1	TG-101T	P922A
Airway adapter for TG-900P	–	50	YG-101T	R801
CO_2 sensor kit (CO_2 adapter + CO_2 sensor) for semi-quantitative method	3.5	1	TG-920P	P907
CO_2 adapter for TG-920P	2	1	JG-920P	K984
CO_2 sensor for TG-920P	1.5	1	TG-121T	P923
Nasal adapter for TG-920P (nasal breathing)	–	30	YG-120T	V921
Nasal adapter for TG-920P (naso-oral breathing)	–	30	YG-121T	V922
Nasal adapter for TG-920P (oxygen cannula adjustment)	–	30	YG-122T	V923
Airway adapter for TG-920P	–	30	YG-111T	R804
Surgical tape	–	1	#1527	Y242
CO_2 sensor kit (CO_2 adapter + CO_2 sensor) for quantitative method	4	1	TG-950P**	P905
CO_2 adapter for TG-950P	2	1	JG-950P	K982
CO_2 sensor for TG-950P	2	1	TG-201T	P921
Airway adapter for adult and children (Weight 10 kg), TG-950P	–	30	YG-201T	R802
Airway adapter for children and neonates (Weight 3 to 10 kg), TG-950P	–	30	YG-202T	R803
CO_2 sensor kit (CO_2 adapter + CO_2 sensor) for quantitative method	3.5	1	TG-970P	P909
CO_2 adapter for TG-970P	0.5	1	JG-970P	K987
CO_2 sensor for TG-970P	3	1	TG-221T	P924
Airway adapter for children and neonates (Weight 7 kg or more), TG-970P	–	30	YG-211T	R805
Airway adapter for infants and neonates (Weight 2 to 7 kg), TG-970P	–	30	YG-213T	R806

** TG-950P CO_2 sensor kit is not available for BSM-6000A series.

For SpO$_2$ Monitoring

Name		Length (m)	Qty	Code No.	Supply Code No.
SpO$_2$ connection cord (for Masimo SpO$_2$ probe)	for LNOP series probe	3.6	1	JL-630P	–
	for LNCS series probe	3.0		JL-631P	–
SpO$_2$ connection cord (for Nellcor SpO$_2$ probe)		3.0		JL-650P	–
SpO$_2$ connection cord (for Nihon Kohden SpO$_2$ probe)		2.5		JL-900P	K931
SpO$_2$ adapter		2.5		JL-500P1***	–
				JL-500P2***	–
Finger probe		1.6		TL-201T	P225F
Multi-site probe				TL-220T	P225G
Finger probe (for 50 kg or more, adults or children)				TL-630T3	P310C
Finger probe (for 20 kg or more, adults or children)				TL-631T3	P311C
Multi-site Y probe (for adults, children and neonates, disposable)			5	TL-260T**	P205A
SpO$_2$ probe (for adult, disposable)		0.8	24	TL-271T	P203A
		1.6		TL-271T3	P203E
SpO$_2$ probe (for child, disposable)		0.8		TL-272T	P203B
		1.6		TL-272T3	P203F
SpO$_2$ probe (for neonate/adult, disposable)		0.8		TL-273T	P203C
		1.6		TL-273T3	P203G
SpO$_2$ probe (for child/infant, disposable)		0.8		TL-274T	P203D
		1.6		TL-274T3	P203H
Disposable probe (for adults and neonates)		0.8	5	TL-051S	P228A
		1.6		TL-052S	P228B
Disposable probe (for adults, children and infants)		0.8		TL-061S	P229A
		1.6		TL-062S	P229B
COTTONY tape		–	20	340703*	P259
Probe fastener			30	YS-093P2	P267
Attachment tape			3 × 30	–	P263
Sponge attachment tape S for TL-260T multi-site Y probe**		–	24		P260A
Sponge attachment tape L for TL-260T multi-site Y probe**					P260B
Clip adapter for TL-260T multi-site Y probe**			1		P256
Foam tape for TL-051S/052S/061S/062S disposable probes		–	4 × 25	–	P260
SpO$_2$ check plate for TL-201T finger probe		–	1	6114-121095	–

** TL-260T multi-site Y probe, sponge attachment tapes and clip adapter for TL-260T multi-site Y probe are not available for BSM-6000A series.

*** For the differences between JL-500P1 and JL-500P2, contact your Nihon Kohden representative.

For NIBP Monitoring

Name		Width (cm)	Length (m)	Qty	Code No.	Supply Code No.
Air hose for adults/children		–	1.5	1	YN-900P	S901
			3.5		YN-901P	S902
Extension air hose			1.5		YN-990P	S903
Cuff for infants		5	0.15		YP-960T	S943A
Cuff for children	Small	7			YP-961T	S943B
	Standard	10			YP-702T	S949A
					YP-962T	S943C
Cuff for adult	Standard	13			YP-703T	S949B
					YP-963T	S944B
	Large	15			YP-964T	S944C
Cuff for thigh		19			YP-965T	S944D
Disposable cuff for infants		6	0.17	20	YP-810P	S945C
Disposable cuff for children		8			YP-811P	S945D
Disposable cuff for adults	Small	10			YP-812P	S946E
	Standard	14	0.2		YP-813P	S946F
	Medium large	15			YP-814P	S946G
	Large	17			YP-815P	S946H
	Extra large	18			YP-816P	S946I
Disposable cuff for thigh		20			YP-817P	S946J
Air hose for neonates		–	1.5	1	YN-920P	S904
			3.5		YN-921P	S905
Disposable cuff for neonates		2	0.2	10	YP-820P	S948A
		3			YP-821P	S948B
		4			YP-822P	S948C
		4.5			YP-823P	S948D
		5			YP-824P	S948E
Sterilized disposable cuffs for neonates		3	0.21	1	No. 11*	S260
		4			No. 12*	S260A
		5			No. 13*	S260B

For IBP Monitoring

Becton Dickinson Reusable Transducers

Name	Length, Description	Qty	Code No.	Supply Code No.
IBP connection cord	For P23XL-1, P10EZ-1 and Becton Dickinson transducers, 3.5 m	1	JP-900P	K951
IBP connection cord	For Becton Dickinson transducers, 0.3 m	1	JP-910P	K952
IBP transducer	–	1	P23XL-1	–
IBP transducer	–	1	P10EZ-1	–
Monitoring kit	For P23XL-1	5	SCK-520*	S571
Super dome	–	10	TA-1015T	–
Dome	With membrane, rotatory lure lock	12	TA-1010ND	–
Criti flo	3 cc	10	TA-4004	–
Criti flo	30 cc	10	TA-4005*	–
Transducer holder	–	1	ZY-101U*	S238
Transducer holder	For P23XL-1	1	TA-9010*	–
Adapter 2	For P23XL-1, used with ZY-101U	1	–	S239
Pressure tubing	15 cm	25	PT-06	–
Pressure tubing	30 cm	25	PT-12	–
Pressure tubing	60 cm	25	PT-24	–
Pressure tubing	90 cm	25	PT-36	–
Pressure tubing	120 cm	25	PT-48	–
Pressure tubing	150 cm	25	PT-60	–

Becton Dickinson Disposable Transducers

Name	Length, Description	Qty	Code No.	Supply Code No.
IBP connection cord	3.5 m	1	JP-900P	K951
IBP connection box	2.7 m, for 4 channels	1	JP-940P	–
Monitoring kit	For cerebral pressure	10	DX-100*	–
Monitoring kit	For neonates	10	DX-200*	–
Monitoring kit	With flush device	10	DX-300*	–
Monitoring kit	For arm mounting	5	DX-312*	–
Monitoring kit	For pole mounting	5	DX-360*	–
Monitoring kit	For pole mounting	5	DX-360R*	–
Monitoring kit	For triple line	3	DX-360TT*	–
Monitoring kit	For pole mounting	5	DX-360SD*	–
Transducer fixing plate	–	1	G-TBG2	–
Transducer fixing plate	–	1	G-TMM	–
Transducer fixing plate	–	1	G-UMM	–
Safe needle	For DX-360SD	50	TA-BPN*	–

Edwards Lifesciences (Baxter) Disposable Transducers

Name	Length, Description	Qty	Code No.	Supply Code No.
IBP connection cord	For Edwards Lifesciences (Baxter) transducers, 3.5 m	1	JP-920P	L901

Edwards Lifesciences (Baxter) blood pressure transducers are available direct from Edwards Lifesciences (Baxter) (www.edwards.com) or their suppliers.

Other

Name	Length, Description	Qty	Code No.	Supply Code No.
IBP connection cord	For Biosensor, 3.5 m	1	JP-960P	K957
ECG/BP output cable	Connects to other equipment for signal output (5 m)	1	YJ-910P	K974
	Connects to other equipment for signal output (0.3 m, horn jack type)	1	YJ-920P	K975
Pressure bag	–	1	ACS-222*	S160
Disposable 3-way stopcock	–	50	318434*	S180
3-way stopcock	3 core	1	MF-3F*	S314
3-way stopcock	5 core	1	MF-5F*	S315
Holder	For 5 core stopcock	1	–	S226

For Temperature Monitoring

Name	Purpose	Length (m)	Qty	Code No.	Supply Code No.
Temperature connection cord	For reusable probe/disposable probe	0.3 m	1	JT-900P	K961
Reusable thermistor probe	For adult rectum	3.5 m	1	401J**	P240A
	For child rectum			402J**	P241A
	Disc type			409J**	P242C
Probe cover	For 401J	–	10	–	P249
Temperature insulation pad	For 409J		5 dozens	336468	P252
Extension cable	For disposable probes	3 m	1	5-15801	L280A

** These thermistor probes are available direct from YSI, Yellow Springs Instrument Inc., Yellow Springs Ohio 45387, USA; Phone +1 937-767-7241.
The temperature disposable probes are available direct from Kendall Healthcare Products Company (www.kendallhq.com) or their suppliers.

For BIS Monitoring (Using the BIS Processor/BISx)

Name	Length, Description	Qty	Code No.	Supply Code No.
BISx connection cable	0.3 m	1	YJ-671P	–

Aspect patient interface cable and BIS sensors are available direct from Aspect Medical Systems (www.aspectmedical.com) or their suppliers.

For CO Monitoring

Name	Measuring Method and Catheter	Length (m)	Qty	Code No.	Supply Code No.
CO connection cord	Bath probe and inline sensor methods	2.0	1	JT-950P	K962
Bath probe	Any catheter, bath probe method	1.5	1	SP-5030	–
Inline sensor	Becton Dickinson catheter inline sensor method	–	25	SP-5045	–
Inline sensor connection cable			1	SP-4045	–
Inline iced injectate kit			4	SP-4500	–

Name	Measuring Method and Catheter	Length (m)	Qty	Code No.	Supply Code No.
Life kit	Bath probe and inline sensor methods	–	5	DX-336DT*	–

Becton Dickinson Thermodilution Catheters

Code No.	Specifications	Thickness (F)	Lumen	Total length (m)	Qty	Supply Code No.
TC-664MP*	Made of polyurethane	6	4	1.1	1	–
TC-704MU*	Soft type	7				–
TC-774MP*	Made of polyurethane	7				–

Edwards Lifesciences (Baxter) Catheters

Edwards Lifesciences (Baxter) catheters are available direct from Edwards Lifesciences (Baxter) (www.edwards.com) or their suppliers.

For O_2 Monitoring

Name	Length (m)	Qty	Code No.	Supply Code No.
FiO_2 connection cord	3	1	JO-900P	K941
O_2 sensor	0.6	1	074705	P911
T shaped adapter	–	1	110774	V912

For CO_2 Sidestream Monitoring

Refer to the AG-400R CO_2 Unit or Oridion Portable Bedside Monitor Microcap® Operator’s Manual.

For BIS Monitoring (Using the BIS Monitor)

Refer to the BIS Monitor Operator’s Manual.

For Anesthetic Agent Monitoring

Refer to the AG-920R, GF-110PA or GF-210R Multigas Unit or GF-120PA or GF-220R Mutigas/Flow Unit Operator’s Manual.

For FLOW/Paw Monitoring

Refer to the GF-120PA Multigas/Flow Unit Operator’s Manual.

For EEG Monitoring

Refer to the AE-918P Neuro Unit Operator’s Manual.

General Requirements for Connecting Medical Electrical Systems

When more than one electrical instrument is used, there may be electrical potential difference between the instruments. Potential difference between instruments may cause current to flow to the patient connected to the instruments, resulting in electrical shock (micro shock). Therefore, electrical instruments must be appropriately installed as specified in IEC 60601-1-1: 2000.

The following is an extract from IEC 60601-1-1 “Medical electrical equipment Part 1: General requirements for safety”. For details, refer to IEC 60601-1-1 and consult with a biomedical engineer.

Examples of combinations of MEDICAL ELECTRICAL EQUIPMENT and non-medical electrical equipment

Situation No.		Medically used room		Non-medically used room	Feasible solution (See clause 19 in all situations)
		Inside the PATIENT ENVIRONMENT	Outside the PATIENT ENVIRONMENT		
1	1a Items A and B in PATIENT ENVIRONMENT	A IEC 60601 B IEC 60601			
	1b Items A and B in PATIENT ENVIRONMENT	A IEC 60601 B IEC XXXXX			For B: Additional protective earth or separating transformer
	1c Item A powered from specified power supply in item B in PATIENT ENVIRONMENT	A IEC 60601 B IEC XXXXX			For B: Additional protective earth or separating transformer
2	2a Item A in PATIENT ENVIRONMENT and item B in medically used room	A IEC 60601	B IEC 60601		
	2b Item A in PATIENT ENVIRONMENT and item B in medically used room	A IEC 60601	B IEC XXXXX		For B: See 19.201 and its rationale
3	3a Item A in PATIENT ENVIRONMENT and item B in non-medically used room	A IEC 60601 common protective earth		B IEC 60601 or IEC XXXXX	For B: See 19.201 and its rationale
	3b Item A in PATIENT ENVIRONMENT and item B in non-medically used room	A IEC 60601 protective earth		B IEC 60601 or IEC XXXXX protective earth with potential difference	For B: Additional protective earth or SEPARATION DEVICE

KEY TO TABLE

- Additional protective earth: If necessary, provide additional protective earthing, which is permanently connected (see also 58.201).
  NOTE Equipment modification may be required.
- Separating transformer: If necessary, limit the ENCLOSURE LEAKAGE CURRENT, by using an additional separating transformer according to annex EEE.
  NOTE 1 No equipment modification is required.
  NOTE 2 A separating transformer is a transformer with one or more input winding(s) separated from the output winding(s) by at least basic insulation [IEC 60989].
- SEPARATION DEVICE: If necessary, apply SEPARATION DEVICE.
- IEC 60601: MEDICAL ELECTRICAL EQUIPMENT in compliance with IEC 60601.
- IEC XXXXX: Non-medical equipment in compliance with relevant IEC safety standards.

Manufacturer

NIHON KOHDEN CORPORATION

1-31-4 Nishiochiai, Shinjuku-ku
Tokyo 161-8560, Japan
Phone +81 (3) 5996-8036
Fax +81 (3) 5996-8100

EC REP European Representative

NIHON KOHDEN EUROPE GmbH

Raiffeisenstrasse 10
61191 Rosbach v.d.H., Germany
Phone +49 6003 827-0
Fax +49 6003 827-599

NIHON KOHDEN ITALIA S.r.l.

Via San Tomaso 78
24121 Bergamo, Italy
Phone +39 035 219543
Fax +39 035 232546

NIHON KOHDEN IBERICA S.L.

C/Ulises 75A
28043 Madrid, Spain
Phone +34 917 161 080
Fax +34 913 004 676

NIHON KOHDEN AMERICA, INC.

90 Icon Street, Foothill Ranch, CA 92610, USA
Phone +1 (949) 580-1555
Fax +1 (949) 580-1550

NIHON KOHDEN FRANCE SARL

8, rue Francois Delage, 94230 Cachan, France
Phone +33 1 49 08 05 50
Fax +33 1 49 08 93 32

NIHON KOHDEN FIRENZE S.r.l.

Via Torta 72/74
50019 Sesto Fiorentino (FI), Italy
Phone +39 055 3045 1
Fax +39 055 308548

NIHON KOHDEN TRADING (SHANGHAI) CO., LTD

5F Hui Jin Business Mansion
No. 259 Wuzhong Road, Shanghai 201103, China
Phone +86 (21) 6270-0909
Fax +86 (21) 6270-9700

Beijing Branch

Room 1501, East Ocean Centre
No. 24A JianGuoMenWai Street, Beijing, 100004
Phone 010-6515-5750
Fax 010-6515-5758

Guangzhou Branch

Room 2514, Yian Plaza
No. 33 Jian She Liu Ma Road, Guangzhou, 510060
Phone 020-8363-3737
Fax 020-8363-3807

NIHON KOHDEN SINGAPORE PTE LTD

1 Maritime Square, #10-34 (Lobby C), Harbour Front Centre
Singapore 099253
Phone +65 6376-2210
Fax +65 6376-2264

NIHON KOHDEN KOREA, INC.

Hannam Tower Annex Bldg. Suite 203
730 Hannam-dong, Yongsan-gu, Seoul, Korea 141-210
Phone +82 (2) 3273-2310
Fax +82 (2) 3273-2352

The model and serial number of your instrument are identified on the rear or bottom of the unit.
Write the model and serial number in the spaces provided below. Whenever you call your distributor concerning this instrument, mention these two pieces of information for quick and accurate service.

Model ______________________ Serial number ______________________

Your Distributor

PRINTED IN JAPAN